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NEOPLASMS OF THE ANTERIOR ABDOMINAL WALL WITH SPECIAL CONSIDERATION OF DESMOID TUMORS

Experience with 391 Cases and a Collective Review of the Literature

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From the Mixed Tumor Service of the Memorial Hospital for Cancer and Allied Diseases, New York, New York.

PART I

INTRODUCTION

DURING a recent survey of benign and malignant tumors of the soft somatic tissues encountered on the Mixed Tumor Service of the Memorial Hospital, it was found that neoplasms of the anterior abdominal wall frequently presented problems of sufficient importance to warrant special study. The literature contains no comprehensive reports which deal specifically with tumors of all varieties limited to the anterior abdominal wall or with diseases of the abdominal wall in general, except for Cullen's classic monograph (26) on diseases of the umbilicus and von Klot's review of collected cases of tumors of the abdominal wall, published in 1921 (53).

Whereas amputation may finally be resorted to for a malignant growth on one of the limbs, radical excision of an appreciable segment of the anterior abdominal wall, followed by the necessary reparative plastic procedures, provides situations of unusual surgical difficulty. Also, standard techniques in radiation therapy must be altered in treating tumors of the anterior abdominal wall because of the highly vulnerable underlying intestines and ovaries. These therapeutic considerations, together with our accumulated data on the clinical behavior of abdominal-wall neoplasms, prompted the present investigation. The anterior abdominal wall may well be considered as a surgical organ because of these peculiar problems in addition to the well recognized importance of this anatomic structure in umbilical and inguinal hernias and the healing of laparotomy wounds.

The present report is based on an analysis of 470 tumefactions in this locality and includes 391 cases of neoplastic disease. The patients were observed and treated at the Memorial Hospital from 1917 to 1943, inclusive. Only those cases have been considered in which tissue was available for microscopic examination (except for hemangioma of the skin) and in which the follow-up data were adequate. Tumors which were located below Poupart's ligament, i.e., situated entirely within the groin, were omitted from this study.

Surgical anatomy. Topographically, the anterior abdominal wall is bounded above by the flare of the costal margins and the xyphoid process of the sternum, and below by the iliac crests, inguinal ligaments, pubic crests and pubic symphysis. The large flat muscles should be regarded as the anterior abdominal wall, the posterior abdominal wall being considered as that portion which is composed of the psoas major and minor, quadratus lumborum, and iliacus muscles. The principle structures that comprise the anterior abdominal wall are the recti, external and internal oblique, transversalis, pyriformis, and lower intercostal muscles, together with their enveloping fascial sheaths and aponeuroses.

The blood supply is furnished by the superior and inferior mesenteric, internal mammary, lower two intercostal, lumbar, iliolumbar, and circumflex iliac arteries. Venous drainage above the umbilicus is taken care of by the superior vena cava, below the umbilicus by the inferior vena cava, and from the umbilicus into the portal circulatory system by the veins of the round ligament of the liver.

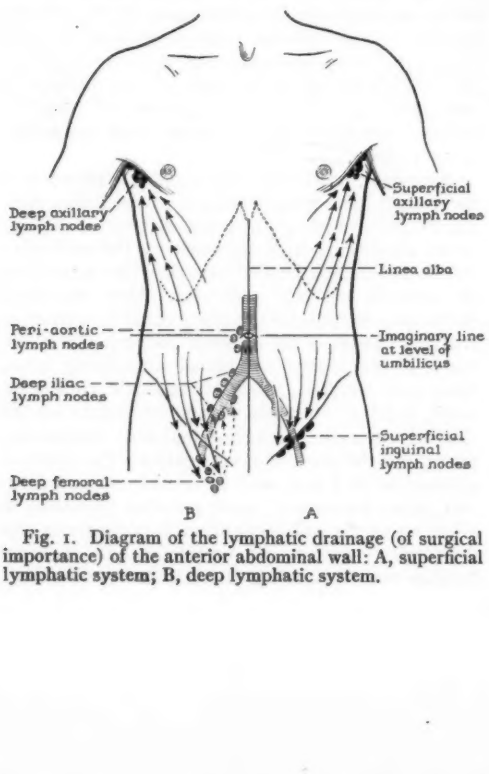

Fig. 1. Diagram of the lymphatic drainage (of surgical importance) of the anterior abdominal wall: A, superficial lymphatic system; B, deep lymphatic system.

The superficial lymphatic vessels of the upper anterior abdominal wall drain into the superficial axillary lymph nodes, and those of the lower anterior abdominal wall empty into the superficial inguinal nodes. The deep lymphatics of the upper anterior abdominal wall run to the deep axillary lymph nodes, and those of the lower anterior abdominal wall drain into the deep femoral group via the inferior epigastric and deep circumflex iliac trunks and into the periaortic nodes through the lymphatics which accompany the lumbar arteries and veins (Fig. 1).

The umbilicus is of particular surgical interest because of its relation to the portal circulation and the liver, peritoneal cavity, urinary bladder, and anterior mediastinum, in addition to its embryonic rudimentary structures (umbilical ligaments). The superficial lymphatics of the umbilical ring empty into the superficial axillary and inguinal lymph nodes. The deep lymphatics of the umbilical ring run to the deep axillary, the anterior mediastinal (via the internal mammary trunks), the deep femoral (via the inferior epigastric trunks), and the periaortic lymph nodes (via the lymphatics which accompany the lumbar vessels). The lymph flow may also be directed to the deep iliac group from the deep femoral lymph nodes. Still other lymphatics ascend along the ligamentum teres (obliterated umbilical vein) to reach the porta hepatis (Fig. 2). The lymphatics of the urinary bladder anastomose with those of the umbilicus via the vestigial urachal structures.

TABLE I.—TUMEFACTIONS OF ALL KINDS IN THE ANTERIOR ABDOMINAL WALL (1917 to 1943, inclusive)

Type of Tumor	Cases	Per cent
Total	470	100.0
Neoplastic	391	83.2
Benign tumors	242	55.5
Primary malignant tumors	63	13.4
Metastatic malignant tumors	64	13.6
Malignant lymphomas	22	4.7
Non-neoplastic	79	16.8
Cysts	24	5.1
Tumefactions inflammatory in origin	31	6.6
Miscellaneous lesions simulating tumors	24	5.1

Lymph nodes are largely confined to the deeper fascial planes, recti muscles, and the periumbilical preperitoneal tissues (24, 59, 99). They are not major groups, but are small intercalated nodes scattered along the lymphatic pathways.

The linea alba, a tendinous raphe which stretches down the middle of the anterior abdominal wall between the xyphoid process and the symphysis pubis, is formed by the blending of the aponeuroses of the oblique and transversalis muscles. As this dense fascial band is not perforated by lymphatic capillaries, it partitions the deep lymphatic system of the anterior abdominal wall into right and left halves, so that cross-metastases of intramural tumors occur only when a malignant growth is situated behind the transversalis fascia or the posterior rectus sheath, i.e., in the preperitoneal fatty areolar layer—a most unlikely location for a primary lymphatic-metastasizing neoplasm. There are, however, sufficient lymphatic anastomoses at all levels in the umbilical zone so that bilateral or even quadrilateral regional lymph-node metastases may occur from a primary malignant tumor in this central area.

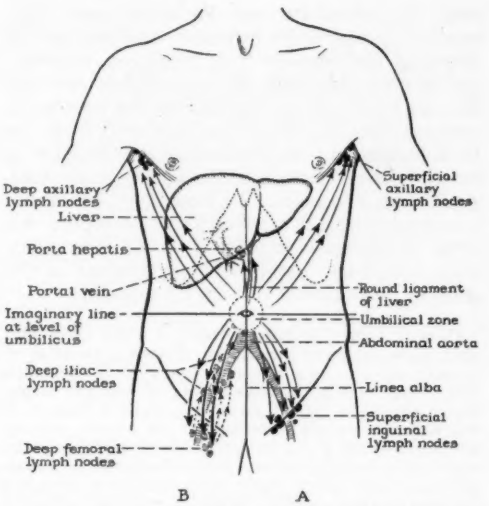

Fig. 2. Diagram of the lymphatic drainage (of surgical importance) of the umbilical zone: A, superficial lymphatic system; B, deep lymphatic system.

BENIGN TUMORS

There were 242 benign tumors (51.5 per cent) in our series of 470 tumefactions in the anterior abdominal wall, constituting the largest group (Table I). Of the 305 primary neoplasms, 80 per cent were benign and 20 per cent were malignant. The sexes were almost equally affected (130 males and 112 females). The ages of the patients varied from six weeks to seventy-seven years, and the average age was thirty-three years.

TABLE II.—BENIGN TUMORS OF THE ANTERIOR ABDOMINAL WALL

Morphological type	Cases	Per cent
Total	242	100.0
Lipoma	48	19.8
Neuronevus	41	16.9
Hemangioma	33	13.6
Epithelial papilloma	29	20.0
Fibroma	22	9.1
Neurofibroma	22	9.1
Keratosis or keratotic papilloma	20	8.3
Desmoid tumor	17	7.0
Lymphangioma	4	1.7
Dermatomyoma	2	0.8
Schwannoma	2	0.8
Sweat-gland adenoma	1	0.4
Xanthofibroma (perithelial)	1	0.4

Thirteen distinct morphological types of tumors were encountered (Table II). The common benign neoplasms in order of their frequency were lipomas, neuronevi, hemangiomas, epithelial papillomas, fibromas, neurofibromas, and keratoses or keratotic papillomas. Lipomas are the most common of all tumors, in addition to being the most frequent-occurring benign tumors (20 per cent) in the anterior abdominal wall. Benign tumors which may occasionally offer difficulties in management are the nevus unius lateris, extensive neurofibromas of the von Recklinghausen type, desmoid tumors, and lymphangiomas.

The management of nevus unius lateris, or neuropathic papilloma, has been described by Pack and Sunderland (87) and consists of complete surgical excision of the entire thickness of the involved epidermis, occasionally in multiple stages. Plastic repair is usually necessary; it is done either by undermining of the skin sufficiently to permit primary wound closure with sliding flaps or by skin grafting. It is essential that no tumor tissue be left behind for this neoplasm is not infrequently subject to malignant transformation.

There were 22 neurofibromas in this series and, of these, 13 were of the von Recklinghausen type. The solitary encapsulated neurofibroma is usually located subcutaneously and is enucleated with

ease. The plexiform von Recklinghausen type, however, is frequently extensive, multiple, and infiltrating, and requires wide dissection, occasionally in multiple stages, for its complete removal. The policy of radical excision of the neurogenic tumors, especially in patients afflicted with von Recklinghausen's multiple neurofibromatosis, is based on the observation that this type of neurogenic tumor occasionally undergoes malignant transformation. The following case report will serve to illustrate the difficulties and complications which are sometimes encountered in the surgical management of such a neoplasm:

CASE 1. Neurofibromatosis. R. S., a white, male child, aged seven, was first seen at the Memorial Hospital on October 10, 1934, for a congenital tumor of the abdominal wall. There was no familial history of multiple neurofibromatosis. The patient, however, presented stigmata of von Recklinghausen's neurofibromatosis, namely, café-au-lait pigmentation of the skin and skeletal deformity, characterized by lordosis, scoliosis, and stunted growth. Examination revealed a soft compressible tumor, involving the right anterior and posterior abdominal walls and extending from the vertebral column to the umbilicus and from the eleventh rib to the iliac crest. The mass measured approximately 22 by 14 cm. Numerous hard nodules, varying from 1 to 4 cm. in diameter, were scattered throughout the tumor.

First operation (October 12, 1934). The tumor, which was exposed by an oblique transverse incision extending from the vertebral column posteriorly to the midline of the anterior abdominal wall, consisted of numerous tortuous neuromas involving the subcutaneous tissues of the entire loin and right half of the anterior abdominal wall. The nerve whorls also involved the skin for a considerable distance. The tumor extended downward to the lumbodorsal fascia and the fascia covering the external oblique and latissimus dorsi muscles. The entire growth was apparently limited to the area of the cutaneous nerve supply of the anterior and posterior subdivisions of the lateral branches (seventh to the eleventh) of the anterior thoracic nerve (segmental distribution). It appeared to arise where the nerve perforates the interdigitations of the external oblique, serratus anterior, and latissimus dorsi muscles.

A generous portion of the skin which contained multiple neuromas was excised, after which skin flaps were developed from the level of the seventh thoracic vertebra to the iliac crest. The entire tumor and the underlying lumbodorsal fascia and the fascia covering the adjacent external oblique and latissimus dorsi muscles, together with the subcutaneous tissues from the level of the seventh to the level of the tenth thoracic nerves, were dissected out en masse. Closure was effected without difficulty and the wound healed per primum.

Second operation (August 30, 1939) for recurrent plexiform neuroma. The old scar, including a generous skin ellipse, was excised and a wide dissection was carried out for the subcutaneous nodular tumor, which extended from the right lower ribs to the crest of the ilium and the inguinal ligament, and from the vertebral column to the midline of the anterior abdominal wall. Convalescence was uneventful.

Third operation (June 28, 1941) for recurrent plexiform neuroma. A Y-shaped incision was made from the angle of the right scapula around to the lower anterior pectoral fold and down to the iliac crest. The tumor was situated beneath the lumbodorsal fascia and the external oblique muscle. It was multilobulated, infiltrative, and contained a myriad of budding processes. The growth had to be dissected from the retroperitoneal space, perirenal fat, and parietal pleura; the latter was accidentally perforated for a distance of 3 cm. but was easily repaired. Although complicated by pneumothorax, convalescence was uneventful and the wound healed satisfactorily.

Fourth operation (June 5, 1943) for recurrent plexiform neuroma. An oblique incision, 10 cm. in length, was made above and parallel to Poupart's ligament. Skin flaps were prepared superiorly to the level of the right costal margin and inferiorly to the inguinal ligament. The dissection was carried down to the sacrospinalis and external oblique muscles, and the tumor was excised en bloc. The wound was closed with drainage because the extensive skin flaps had produced considerable dead space. Convalescence was stormy and protracted because of a wound infection (staphylococcus aureus hemolyticus), which necessitated sulfadiazine therapy and multiple transfusions of whole blood. The central portion of the wound became necrotic, probably because of the thinness of the skin flaps, but the defect was satisfactorily covered with pinch grafts.

Comment. This case illustrates how invasive a plexiform neurofibroma of the von Recklinghausen type may be, and the repeated formidable surgical procedures often necessary to effect a cure. It also shows how stubbornly recurrent these tumors may be in spite of adequate, radical surgical excision. A similar remarkable case was described by Nancrede (79), in which the anterior cutaneous branches of the lumbar nerves were involved.

Neurofibromas may rarely be located both intramurally and intraperitoneally. Such a situation presents unusual diagnostic difficulties, even during surgical exploration, as shown in the following case report:

CASE 2. Neurofibroma of the ligamentum teres. A.L., a fifty-five-year-old, white, married female, was admitted to the Memorial Hospital on June 22, 1933 for episodes of pain in the right upper abdominal quadrant, nausea, and vomiting of nine years' duration, occurring every two to three months. In January, 1929 a laparotomy had been performed, at another hospital, through an upper right-rectus incision and a hard mass removed from the colon; this proved to be a fecolith. No other abnormalities were apparently noted by the surgeon at this time. The attacks of abdominal pain continued and four years later the patient was able to palpate an abdominal tumor.

Physical examination revealed a well healed, upper right-rectus scar. Just to the right of the midline and midway between the xyphoid process and the umbilicus was a round, hard mass, measuring 7 cm. in its greatest diameter. It was slightly mobile, not attached to the abdominal scar, and appeared to be located intramurally. Fluoroscopic and x-ray studies of the gastrointestinal and biliary tracts revealed no evidence of any intrinsic lesions or calculi. Aspiration biopsy of the tumor did not yield tissue sufficiently characteristic for histological diagnosis.

Operation. The previous scar was excised and an encapsulated, hard tumor, 4 cm. in greatest diameter, was encountered in the subcutaneous tissues. This tumor was continuous with a mass, 10 cm. in greatest diameter, lying beneath the parietal peritoneum. The more superficial and smaller portion of the tumor was located intramurally and the larger portion was located intraperitoneally. The intra-abdominal part of the tumor was adherent to the omentum. The mass was first freed from the adjacent fascia and mus-

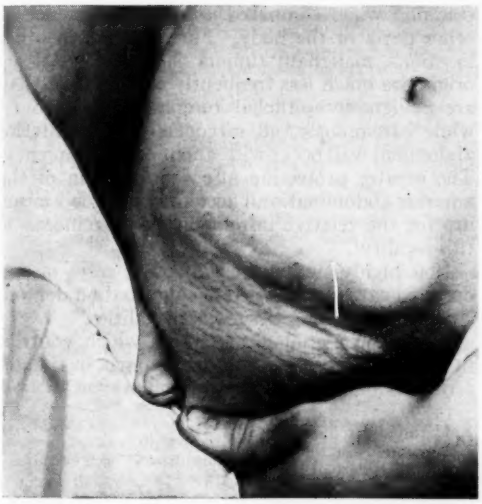

Fig. 3. Case 3. An extensive lymphangioma in the lower anterior abdominal wall and groin, which was removed in a one-stage operation.

cles and as the dissection was carried down to the abdominal cavity, it was observed that the neoplasm arose from the *round ligament of the liver*. The intraperitoneal growth was dissected out from the peritoneal leaves of the falciform ligament, the adherent omentum was separated from the tumor, and the mass was removed *in toto*. The abdomen was closed in layers.

The postoperative course was uneventful and the patient remained symptom free.

Microscopic examination of the surgical specimen revealed the usual structure of a neurofibroma.

Comment. Failure to identify an intramural tumor may in part be due to rapid incision of the abdominal wall, followed by immediate retraction of the parietes, especially if a tumor is not suspected in this location.

In the vascular group, there were 33 hemangiomas and 4 lymphangiomas. Superficial hemangiomas were treated with refrigeration (applications of carbon-dioxide snow) and the subcutaneous lesions were satisfactorily fibrosed with injections of sclerosing solutions. The technique of these procedures has been described by Watson and McCarthy (124). An occasional deep-seated or cirsoid hemagioma was surgically excised. Radium is no longer employed in this clinic for the treatment of skin hemangiomas because extensive follow-up studies (for from ten to fifteen years) have revealed an appreciable number of cases in which the cosmetic end-result was unsatisfactory because of scarring, skin atrophy, and telangiectasis. In the present series, the cosmetic results have been considerably more desirable. Lymphangiomas, on the other hand, are best treated by radical surgical excision, in multiple stages if necessary. These tumors are usually infiltrating, multiple, and may involve the skin. Their saccules frequently harbor pathogenic micro-organisms and virulent wound infections not uncommonly complicate the postoperative course. The following case is illustrative of the extensive dissection frequently required to effect a cure:

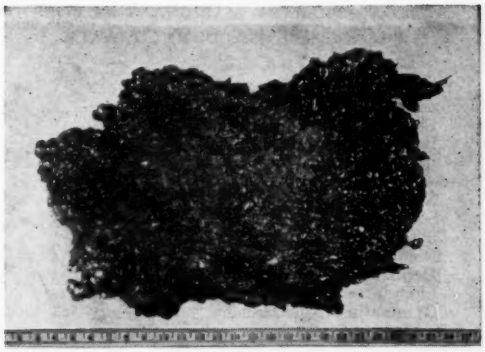

Fig. 4. The surgical specimen of the patient shown in Figure 3. It resembles a large flat sponge and consists of myriads of tiny saccules which contain lymph fluid.

Case 3. Lymphangioma. L.W., a fifteen-year-old, white male, was admitted to the Memorial Hospital on July 6, 1939 for a tumor of the lower anterior abdominal wall and right groin, first noted at the age of three. Examination revealed an irregularly globular, soft, faintly purplish mass, which occupied the right lower abdominal quadrant and extended below Pourpart's ligament. It was situated intramurally and measured 20 cm. in greatest diameter (Fig. 3).

Operation. A linear incision was made beginning on the anterior aspect of the right thigh at the junction of the middle and upper thirds and was continued upward on the anterior abdominal wall to the level of the umbilicus. Skin flaps were developed. Lymphangiomatous tissue involved the deeper layers of the skin in some places, so that the flaps had to be made extremely thin. After considerable dissection, the mass was completely circumscribed from the umbilicus to a point 7 cm. below the femoral trigone and from the corresponding pubic spine to a point over the greater trochanter of the femur. The incision was continued down to the fascia of the external oblique muscle, which was found to be involved. Accordingly, the spermatic cord was isolated and the affected fascia was excised. The dissection was then carried downward, which necessitated the removal of a considerable portion of the fascia lata, and continued medially, which required double ligation of the great saphenous vein—2 cm. and 5 cm. below its entrance into the femoral vein. Drainage was established through a stab wound in the lateral skin flap. Pressure was maintained on the closed wound with a sea-sponge dressing and snug binder. Convalescence was uneventful except for some necrosis of the skin flaps. The resultant defect was satisfactorily covered with Thiersch grafts.

Follow-up examinations have revealed no recurrence of the tumor.

TABLE III.—PRIMARY MALIGNANT TUMORS OF THE ANTERIOR ABDOMINAL WALL

Type of tumor	Cases	
Total		63
Carcinoma (39.7 per cent)		25
Epidermoid carcinoma	17	
Basal-cell epithelioma	6	
Adenocarcinoma	2	
Sarcoma (47.6 per cent)		30
Neurogenic sarcoma	9	
Spindle-cell sarcoma	8	
Synovioma	5	
Rhabdomyosarcoma	4	
Dermatomyosarcoma	2	
Liposarcoma	1	
Granulation-tissue sarcoma	1	
Melanoma (12.7 per cent)		8

The mass, which had been removed en bloc, had the appearance of a large, flat sponge. It was made up of locules containing straw-colored fluid (Fig. 4). Microscopic examination of this tissue revealed the characteristic structure of lymphangioma.

PRIMARY MALIGNANT TUMORS

There were 63 primary malignant tumors in the present series. These represent 13.4 per cent of all tumefactions, 16.1 per cent of all true neoplasms, and 42.3 per cent of all malignant tumors in the anterior abdominal wall. It can be seen from Table I that primary and metastatic tumors occur with about equal frequency in this locality. This is in sharp contrast with the incidence of similar lesions in the soft parts elsewhere, particularly on the limbs, where metastatic malignant tumors are distinctly uncommon. The multiplicity of lymphatic and venous connections, especially with the peritoneal cavity and portal circulation through the umbilicus, makes the anterior abdominal wall particularly vulnerable to secondary cancerous deposits and explains for the most part the relatively high incidence of metastases in this structure.

Carcinoma. Of 63 primary malignant neoplasms, 25 were tumors of epithelial origin; carcinomas represent 6.4 per cent of all neoplasms and 16.8 per cent of all malignant tumors, primary and secondary, in the anterior abdominal wall. There were 14 females and 11 males in this group of patients. The ages varied from thirty-six to seventy-four years, and the average age was fifty-two years. The tumors were classified into three general groups: epidermoid carcinomas, basal-cell carcinomas, and adenocarcinomas (Table III).

It has been estimated by Pack and Le Fevre (84) that 1 of every 20 patients admitted to the Memorial Hospital had epidermoid carcinoma of the skin. Primary carcinoma in the skin of the anterior abdominal wall, therefore, is relatively uncommon when compared with its occurrence in other parts of the body. Furthermore, in other locations, malignant tumors of connective-tissue origin are much less frequently encountered than are malignant epithelial tumors (ratio 5 to 1), while carcinomas and sarcomas in the anterior abdominal wall occur with about equal frequency. The greater protection afforded the skin of the anterior abdominal wall accounts in a good measure for the relative infrequency of carcinoma in this locality[1].

It is highly significant that of 17 cases of epidermoid carcinoma, 12 were engrafted on demonstrable pre-existing tissue abnormalities.

The known etiological factors which contributed toward the genesis of carcinomas in the anterior abdominal wall were as follows:

	Cases
Epidermoid carcinoma	
Abdominal sinuses and scars	5
Radiation dermatitis	4
Psoriasis	2
Arsenical keratoses	1
Adenocarcinoma	
Sebaceous cyst	1
Sweat-gland adenoma	1

Basal-cell cancers occur largely in senescent patients and when they are situated in the skin of the anterior abdominal wall do not differ in their clinical behavior or response to irradiation from similar tumors elsewhere. These cancers, even when far advanced, are managed without difficulty. The majority of them respond satisfactorily to low-voltage roentgen therapy. In those cases in which a very considerable area of skin was involved with extension into the subcutaneous tissues, the tumor was surgically excised and the defect covered with an immediate Padgett skin graft, or with delayed pinch grafts if the wound was infected. Because this neoplasm does not show a tendency to involve the regional lymph nodes, none of the patients required groin or axillary dissections.

An occasional complication in basal-cell epitheliomas of long standing is the development of a superimposed squamous-cell cancer in the chronic ulcer of the primary neoplasm, as shown in the following case report:

CASE 4. Mixed basal-cell and squamous-cell epithelioma. T.W., a seventy-three-year-old, white male, was admitted to the Memorial Hospital on January 24, 1925 for a tumor

[1]The kangri-burn cancers of the Kashmiris and the kairo burn cancers of the Japanese are well known examples of epidermoid carcinoma of the anterior abdominal wall, produced by the repeated application of heat. The "kangri," an earthenware bowl, is heated by means of wood charcoal and is worn under a single, loose garment by the poorer class of Kashmiris. The habit of wearing a portable oven against the anterior abdominal wall for the maintenance of body heat is also prevalent in Japan (120).

of the anterior abdominal wall of fifteen years' duration. Previous treatment elsewhere consisted of numerous applications of caustics and sclerotics, electrocoagulation, infrared therapy, and inadequate doses of low-voltage x-ray therapy.

Physical examination disclosed an extensive, deeply ulcerated, infected tumor which actually replaced the upper half of the anterior abdominal wall. In the center of this huge crater, the recti muscles were exposed for a distance of 2 cm. The appearance was typical of the well known rodent ulcer. No significantly enlarged lymph nodes were palpable in the groins or axillae. Representative sections of tissue removed for biopsy revealed both basal-cell and squamous-cell carcinomas.

The tumor was divided (for therapeutic purposes) into right and left ports. With the 140 kv. machine, each port was given 200 roentgens daily for a total dose of 2,500 roentgens; the factors were 1 mm. of copper filter and a target-skin distance of 50 cm. The neoplasm was shortly replaced by slough and repeated biopsies failed to reveal residual neoplastic tissue.

The patient was readmitted to the Memorial Hospital two months after completion of this treatment for progressive abdominal distention, vomiting, and fever. He died the same day. Postmortem examination revealed perforation of the parietal peritoneum and generalized purulent peritonitis, but there was no evidence of active tumor in the abdominal wall or elsewhere.

Comment. This case shows how effectively low-voltage x-rays can sterilize even the most extensive epitheliomas of the skin. It is most likely that the squamous-cell cancer originated in the chronic rodent ulcer.

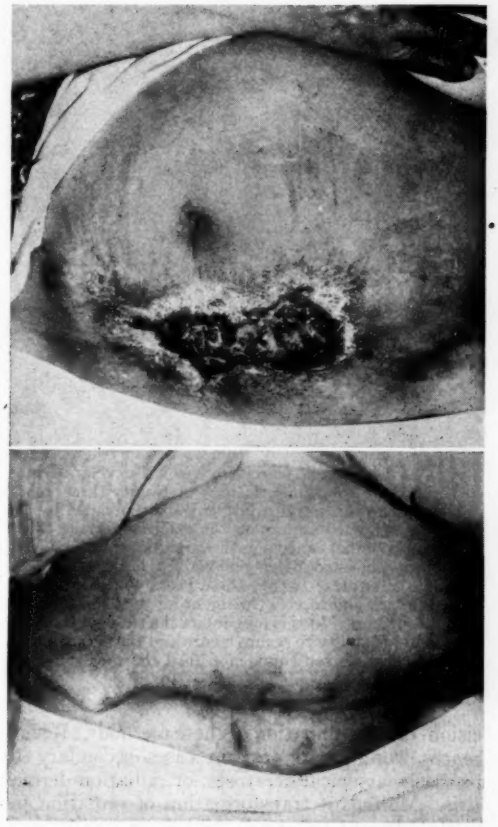

Fig. 5. Top, Carcinomatous degeneration of a chronic ulcer due to injudicious radiation therapy of the abdominal wall for uterine myomas. Treatment consisted of radical surgical excision and primary closure. Bottom, Postoperative photograph.

Epidermoid carcinoma is one of the more serious varieties of abdominal-wall neoplasms, generally because of the specific predisposing factors which favor its development in this locality in the majority of cases, but more particularly because of the occurrence in more than one-third of this group of a definite clinical type of squamous-cell carcinoma which shows a decided tendency toward peritoneal penetration. Among 17 cases of epidermoid carcinoma, there were 6 which terminated fatally; 5 of these were cancers which developed in chronic draining abdominal sinuses or in laparotomy scars and invaded the abdominal cavity.

Primary epidermoid carcinomas in this locality show little tendency to metastasize to the regional axillary or inguinal lymph nodes, or to other parts of the abdominal wall. They are for the most part confined to the skin and superficial subcutaneous tissues in which the lymphatic channels are least abundant. The flat abdominal muscles and deep fascial planes, however, are rich in lymph vessels and a carcinoma at this level metastasizes frequently and early to the regional lymph nodes. While primary epidermoid carcinoma in this locality arises in the skin and is confined to the superficial layers of the abdominal wall, even after it has produced considerable local destruction, regional lymph-node involvement can be expected largely from metastatic carcinomas, which are invariably deposited in the deeper layers. The clinical behavior of metastatic tumors will be more fully discussed in a subsequent section of this report.

In our collection of 25 primary abdominal-wall carcinomas, the only instance of regional lymph-node involvement occurred in a case of sweat-gland cancer which metastasized to the groin. In spite of a radical groin dissection, the patient eventually succumbed to generalized carcinomatosis.

The cured epidermoid cancers were treated like similar lesions elsewhere, i.e., with radium, low- or intermediate-voltage roentgen rays, surgical ex-

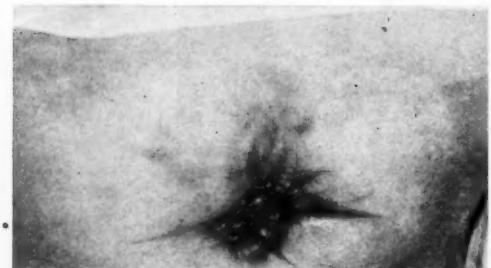

Fig. 6. Epidermoid carcinoma which developed in a chronic draining abdominal sinus of twenty-three years' duration. The peritoneal cavity is usually invaded by the time these growths appear on the external surface. They are the most lethal cancers in the anterior abdominal wall. The sinus persisted after removal of a dermoid cyst. During the ensuing twenty-three years the patient continued to seek and receive treatment for the sinus from the original surgeon. In this long interval she never lost confidence in his ability to secure a cure and the surgeon himself never lost his self-confidence until the cancer became fully developed.

Fig. 7. Epidermoid carcinoma which developed in an appendectomy scar of twenty-five years' duration. This patient presented intraperitoneal involvement on admission. The clinical behavior of this type is identical with abdominal-sinus cancers.

cision, or a combination of these methods. Recurrences were found only in cases secondary to psoriasis, arsenical keratoses, or radiation dermatitis. Malignant transformation of radiation injuries into squamous-cell epitheliomas often produces some of the largest cancers in the anterior abdominal wall, which require extensive surgical excision to effect a cure. In this series, the carcinomas which developed in chronic ulcers due to irradiation were all secondary to injudicious irradiation of the abdominal wall for uterine myomas (Fig. 5).

Cancers which have their origin in postoperative chronic draining abdominal sinuses or in laparotomy scars (Figs. 6 and 7) are specific clinical types and carry a grave prognosis. All of our 5 cases in this group terminated fatally. Death was due to invasion of the peritoneal cavity by the growth. The operative procedures responsible for the persistent sinuses were cholecystectomy (1 case), oöphorectomy for benign ovarian cyst (2 cases) and appendectomy (2 cases). The sinuses or scars were always of long duration and were present ten, twelve, twenty-three, twenty-five, and forty years, respectively, before signs of superimposed malignant growth became evident. In this respect, cancers of abdominal-wall sinuses and laparotomy scars resemble burn cancers (120). All were, however, of the squamous-cell type and did not metastasize to the regional lymph nodes or to other parts of the abdominal wall. In 4 cases, the fistulous tracts had repeatedly been treated with caustics, sclerotics, and the actual cautery for many years. The mechanism for persistent sinus formation had not previously been established in any case nor were there any associated fecal, biliary, or uterine fistulas. Roentgenographic studies revealed no foreign bodies in the abdominal wall or peritoneal cavity. On admission, the one common feature was the advanced, penetrating nature of the growth with intraperitoneal involvement, even though a history of superficial ulceration, bleeding, visible or palpable tumefaction, or pain exceeded a period no longer than six months in any case. Such neoplasms apparently become engrafted on granulation tissue which lines the fistulous tract or sinus. They probably arise at some distance below the skin surface and proceed to grow in both directions, so that considerable intra-abdominal extension has taken place by the time the tumor appears on the external surface. When first seen, all cases were advanced and incurable. These tumors

contained no osteoid tissue or bone, as was encountered by Didier (32).

It is apparent from a review of our cases that primary carcinomas in the skin of the abdominal wall are largely secondary to pre-existing demonstrable lesions of long standing. They offer, therefore, an excellent opportunity for prophylactic cancer therapy. The importance of adequate surgical excision or elimination by other means of fistulous tracts and scar sinuses, and the significance of changes in laparotomy scars cannot be emphasized too strongly.

Sarcoma. Primary sarcomas are more frequently found in the anterior abdominal wall than primary carcinomas. There were 30 primary malignant tumors of connective-tissue origin in this series of 391 neoplasms of the anterior abdominal wall, an incidence of 7.7 per cent. They comprise 20.1 per cent of all malignant tumors and 47.6 per cent of all primary malignant tumors in this locality. Their number would be increased if the desmoid tumors which have undergone malignant transformation into fascial fibrosarcomas were included in this group, but this unique neoplasm—a clinicopathological entity—will be considered separately in a later section of this monograph.

Seven distinct morphological types were encountered (Table III). The more common tumors in order of frequency were neurogenic sarcomas, spindle-cell sarcomas (unclassified), synoviomas, and rhabomyosarcomas, respectively. Occurring more rarely in this region were dermatomyosarcomas and liposarcomas. The diagnosis was established by aspiration biopsy in about three-fourths of the cases.

There were no common causative factors. The sexes were equally affected and the ages of the patients varied from nineteen to sixty-one years, the average age being thirty-four years. It will be noted that these patients were considerably younger than those in the group with carcinoma. Only among the neurogenic tumors could any significant etiological factors be established. Of 9 cases of neurosarcoma, 5 were secondary to von Recklinghausen's neurofibromatosis and 1 originated in a laparotomy scar (Fig. 8).

As the majority of sarcomas arise in the deeper layers of the abdominal wall, they have usually reached considerable proportions by the time they are first noted by the patient or physician. Like sarcomas elsewhere, they show no tendency to involve the regional lymph nodes, but not infrequently they metastasize through the blood stream to distant sites, especially the lungs.

The treatment of these tumors must consist of a wide resection of a full thickness segment of anterior abdominal wall, including the underlying parietal peritoneum. This radical surgical treatment is especially required when one is dealing with highly malignant synoviomas and myosarcomas, tumors which invariably recur and eventually are disseminated widely if treated by limited surgical excision. Irradiation is a most valuable therapeutic adjunct. If the tumor is radiosensitive, as a certain embryonal liposarcoma or an occasional unclassified spindle-cell sarcoma, then high-voltage roentgen therapy may be administered prior to surgical excision with good effect. The majority of soft-somatic-tissue sarcomas are radioresistant. They should, nevertheless, receive preliminary irradiation for the purpose of producing progressive fibrosis of the surrounding tissues. We believe such a postirradiation, desmoplastic tumor bed to be an important factor in delaying or preventing permeation of the blood stream by tumor cells, so that a successful, radical, and well planned surgical procedure can subsequently be carried out. Since a wide margin of skin is included in the dissection, difficulties in wound healing, because of previous irradiation.

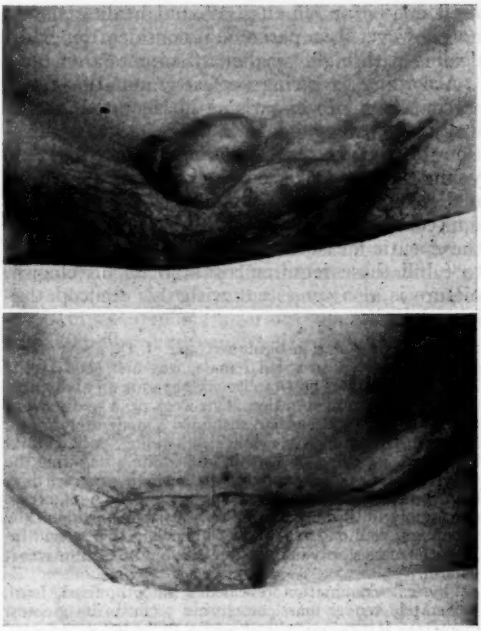

Fig. 8. Top, A neurogenic sarcoma which developed in a laparotomy (Pfannensteil) scar of twelve years' duration. These tumors frequently recur but rarely metastasize. Bottom, Cure was effected by wide surgical excision and primary closure.

need not be anticipated. Wound healing should not, however, be a paramount consideration when dealing with highly malignant tumors anywhere.

According to Ewing (37), a granulation-tissue sarcoma is a process arising in lacerated, chronically infected wounds or in the reactive organization of hematomas. It occurs particularly in young subjects and is extremely rare. The grade of malignancy varies widely, the clinical course is unfavorable, and the condition requires radical therapeutic measures. The following case appears to fulfill these requirements and its histological picture is also consistent with this clinicopathological entity:

CASE 5. Granulation-tissue sarcoma. L.D., a seventeen-year-old, white, unmarried female, was first seen at the Memorial Hospital on October 20, 1943 for an abdominal tumor of two years' duration. One week prior to discovery of the mass, the patient had sustained a moderately severe injury to the tumor site while sleigh riding. A black and blue mark appeared in the skin immediately following the trauma and the patient noted a swelling in this area ten days later (probably a hematoma). This swelling did not increase perceptibly until she again injured the same portion of the abdominal wall one year later. Following this second injury, the mass slowly increased in size but at no time was it painful.

Physical examination revealed a smooth, fixed, hard, moderately tender mass, measuring 5 cm. in its greatest diameter. It was located just medial to the left anterior superior iliac spine. The tumor was apparently situated intramurally, was adherent to the crest of the ilium, and appeared to be inoperable because of its fixity.

Aspiration biopsy did not yield tissue sufficiently characteristic to warrant an anatomic diagnosis.

On November 8, 1943 an excisional biopsy was performed. A transverse incision was made over the lower portion of the mass and was carried down through the fascia of the external oblique muscle, the internal oblique muscle, and the transversalis fascia, all of which were split in the direction of their fibers. This exposed a soft unencapsulated hemorrhagic tumor, from which a wedge of tissue was removed. There was no excessive bleeding. The wound was closed in layers.

Microscopic examination of this tissue revealed a vascular, very cellular structure, consisting for the most part of large, ovoid cells with centrally placed, prominent nuclei and granular cytoplasm. Scattered areas of small spindle cells were also present. The blood vessels were numerous and thin-walled, and many contained hyalinized thrombi. The stroma was made up of a faint reticulin network. The general appearance suggested an angioblastic sarcoma on the one hand and an atypical granulosa-cell tumor on the other.

Radiation therapy was given as follows: 250 kv., 1.5 mm. of copper filter, target-skin distance of 70 cm., one port (10 by 13 cm.), 300 roentgens daily for a total dose of 3600 roentgens. This tumor proved to be extremely radiosensitive and regressed almost completely to palpation following completion of this treatment. It is planned to carry out radical excision of the residual tumor when the skin has sufficiently recovered from the effects of radiation.

Comment. The exact histogenesis of these tumors is not clear. According to Ewing (37), it appears probable that some of the cases arise from fat tissue, and others from atypical proliferation of angioblastic cells.

There were 4 deaths and no recurrences in this group of 30 sarcomas, a relatively low mortality compared with epidermoid carcinoma. It is significant that the fatalities were equally distributed between the cases of synovioma and myosarcoma, tumors which are generally conceded to be highly malignant and capable of pulmonary metastases. As these tumors, when they occur on one of the extremities, are in most instances treated by amputation of the affected limb, a comparable surgical procedure should be adopted when they are encountered in the tissues of the anterior abdominal wall, namely, wide bloc dissection of a full-thickness segment of the abdominal wall. This is mandatory when dealing with synoviomas, highly malignant myosarcomas, or anaplastic spindle-cell sarcomas.

Malignant melanoma. There were 8 primary melanomas in this series, comprising 12.7 per cent of all primary malignant tumors in the anterior abdominal wall. They were situated in or about the umbilicus or somewhere in the upper abdominal quadrants. In 7 cases there was a history of chronic irritation of a mole of long standing by belt, girdle, or corset. The necessity, therefore, of excising nevi which are subject to repeated injury, such as those in the "belt line" of the abdominal wall, is apparent. It is significant that 6 of these patients were males.

Although melanoma is one of the most lethal of neoplasms encountered in oncologic practice, it is an especially grave offender when it is situated in the anterior abdominal wall, for of our 8 patients, only 2 have survived three years or more. The appalling mortality produced by abdominal-wall melanomas may be attributed to the specific lymphatic and venous components of the anterior abdominal wall, which are so constructed that, for a tumor like melanoma, they facilitate widespread dissemination of tumor cells into the portal and systemic circulations and into the lymph nodes of the axillary, mediastinal, inguinofemoral, and deep iliac groups (Figures 1 and 2). On admission, 6 of the 8 patients presented enlargement of the regional lymph nodes, which indicated how early this neoplasm avails itself of the multitudinous lymphatic pathways provided by the anterior abdominal wall. In the majority of cases, the primary lesion did not exceed 2 cm. in greatest diameter.

Melanoma offers the gravest prognosis when it arises in the umbilicus because of its rapid entree into the portal circulation, peritoneal cavity, and liver, via the lymphatics and veins of the round ligament of the liver. Furthermore, melanomas which occur in the umbilical zone may early in-

vade the circle of anastomotic lymph vessels, both superficial and deep, located in this area, so that cross-metastases, axillary and groin metastases, and dissemination to other parts of the abdominal wall are commonly observed. In this series of 63 primary malignant tumors in the anterior abdominal wall, the melanomas are the only group which metastasized frequently to the regional lymph nodes, produced cross-metastases (bilateral axillary or bilateral inguinofemoral), proximal and distal metastases (axilla and groin), or spread to other parts of the abdominal wall. The relatively frequent selection of these tumors for the umbilical zone when they occur in the skin of the abdominal wall, and their tendency toward early transit into the superficial and deep lymphatic systems readily explain the characteristic and consistent metastatic pattern produced by melanoma in this locality.

Since melanomas are rarely radiosensitive (85), these tumors are best treated surgically. Whatever operative procedure is elected, the location of the tumor and the surgical accessibility of demonstrably diseased lymph nodes, and, also, of those regional lymph nodes which might eventually be included in the metastatic process, must be taken into consideration if a successful result is to be anticipated.

If a melanoma arises in the umbilicus, nothing less than complete excision of the umbilicus, together with a wide margin of the surrounding tissues and the round ligament of the liver, will suffice. If, as is common, there is homolateral axillary and groin metastasis, then axillary and groin dissections should accompany the procedure of radical excision of the primary tumor. The groin dissection should include removal of the deep iliac lymph nodes because whenever the deep inguinal or femoral lymph nodes contain metastatic melanoma, the nodes of the deep iliac group are frequently involved. This can be accomplished by splitting the inguinal ligament and continuing the dissection retroperitoneally up to the level of the iliac bifurcation or even higher if necessary (86).

If the melanoma is situated in the upper anterior abdominal wall but not in the midline, an axillary dissection should accompany excision of the primary tumor, and if the melanoma is located in the lower anterior abdominal wall, a radical groin dissection should be included in the operation; these dissections are to be done whether or not palpably diseased lymph nodes are present. A midline lesion requires bilateral axillary or bilateral groin dissections, according to whether the neoplasm is located above or below the umbilical level. The surgical procedure should include not only all clinically demonstrable metastases, but also all surgically accessible lymph nodes that are most likely to become involved.

The anatomic principles underlying abdominoperineal resection for rectal cancer or radical mastectomy for breast cancer, namely, removal en bloc of the primary tumor and its regional groups of lymph nodes at one operation, can readily be applied for those malignant tumors of the skin which have a tendency to metastasize to the regional lymph nodes and which are situated reasonably close to this group or groups of nodes. Probably the most notorious offender is melanoma, and nowhere can "excision and dissection in continuity" (83) be employed more effectively than in the anterior abdominal wall.

The following case report will illustrate the management of melanoma in the anterior abdominal wall by the operation of "excision and dissection in continuity:"

CASE 6. Malignant melanoma. G.F., a thirty-six-year-old, white male, first reported to the Memorial Hospital on September 8, 1943 complaining of a growth on the left side of the abdomen which had been present as long as he could remember and which had bled on several occasions during the past six months. It had been subject to chronic irritation by his belt. The patient had also noted a swelling in the left groin for the past five weeks. A diagnosis of malignant melanoma was made on the basis of a biopsy performed before he was referred to the Memorial Hospital.

Physical examination disclosed a papillary, raised, oval, moderately firm, sharply demarcated tumor, measuring 2 cm. in greatest diameter, in the skin of the left anterior abdominal wall just above and to the left of the umbilicus. The mass was bluish black in color and its surface was slightly ulcerated. A firm mass of lymph nodes, measuring 3 cm. in diameter, was situated in the corresponding groin.

The patient was treated on the principle of excision and dissection of the primary tumor and its regional lymph nodes in continuity or en masse. Since the melanoma was situated above the level of the umbilicus, there was imminent danger of axillary metastases, even though there were significantly enlarged lymph nodes in the corresponding groin. Operation consisted of wide elliptical incisions to encompass the primary melanoma, subcutaneous tissues, and the underlying fascia of the external oblique and latissimus dorsi muscles, which necessitated the development of extensive skin flaps. The incisions were extended downward on the thigh to the junction of the upper and middle thirds so that a radical groin dissection could be carried out at the same time. This consisted in the removal of all lymphatic tissue, superficial and deep, from the femoral trigone, inguinal area, and iliac region, and required severance of Poupart's ligament and a retroperitoneal dissection to the level of the iliac bifurcation. The initial incisions were then extended superiorly, pectoral flaps were prepared, and a complete axillary dissection was performed. The long thoracic nerve and subscapular vessels and nerve were preserved. All intervening fascia, which was exposed by the skin flaps, was included in the dissection (from the primary tumor site to the groin and proximally to the axillary space). The entire specimen was removed en bloc. The wound was closed and split rubber drains were inserted

TABLE IV.—METASTATIC MALIGNANT TUMORS OF THE ANTERIOR ABDOMINAL WALL

Primary site	Cases	
Total		64
Carcinoma (84.4 per cent)		54
Ovary	10	
Stomach	6	
Uterus	5	
Bronchus	5	
Kidney	4	
Breast	2	
Sigmoid	2	
Cecum	1	
Transverse colon	1	
Rectum	1	
Liver	1	
Pancreas	1	
Gall bladder	1	
Vulva	1	
Uvula	1	
Primary undetermined	4	
Implantation cancer	8	
Sarcoma and miscellaneous types (15.6 per cent)		10
Melanoma	3	
Teratoma testis	1	
Mesodermal mixed tumor—vulva	1	
Lymphoepithelioma—nasopharynx	1	
Cystosarcoma phylloides	1	
Liposarcoma	1	
Xanthoma (Hans-Schiller-Christian)	1	
Multiple myeloma	1	

through two stab wounds in the lateral skin flap. Drainage was also established through a stab wound in the thigh. Convalescence was uneventful and the wound healed per primam.

Pathological report. Malignant melanoma with metastasis to one large node in the groin. Twenty-five other nodes were examined and contained no tumor.

Only by proper surgical planning—radical excision, in one stage, of the primary tumor and underlying fascia, together with the regionally involved lymph nodes and those nodes most likely to become involved—can the surgeon hope to meet the challenge presented by melanomas in the anterior abdominal wall.

METASTATIC MALIGNANT TUMORS

Primary and secondary malignant tumors occur with about equal frequency in the anterior abdominal wall (Table I). There were 64 cases of metastatic and implantation cancers in this series. They comprise 16.4 per cent of all neoplasms and 42.9 per cent of all malignant neoplasms in this locality. Their incidence is probably much higher than our figures indicate. Frequently, the primary source has been established by the time secondary deposits appear, which obviates need for a biopsy. Only those cases in which tissue was available for microscopic examination were included in this study. The number of cases would be further increased if malignant lymphomas were also to be considered in this group.

The great majority of metastatic neoplasms in the anterior abdominal wall are carcinomas (84.4 per cent). The remainder consist of sarcomas, melanomas, and rare miscellaneous malignant tumors (Table IV). In 42 of 54 cases of metastatic carcinoma, the primary source was established, in 4 instances the source was not determined, and there were 8 cases of implantation cancer. The most frequent primary sources for metastatic abdominal-wall carcinoma in this series were the ovary, stomach, large bowel, bronchus, and kidney, respectively. Less common sites of origin were the female breast, the liver, pancreas, and gall bladder.

The location and clinical behavior of metastatic carcinoma differ strikingly from those of primary carcinoma in the anterior abdominal wall. Metastatic cancer is most frequently situated in or about the umbilicus (because of the connection of the umbilical lymphatics with those of the round ligament of the liver and, also, with the lymph vessels accompanying the vestigial urachal structures); if located elsewhere in the anterior abdominal wall, it is usually to be found in the deeper layers. Primary carcinoma is always located in the skin (with the exception of cancer secondary to chronic abdominal sinuses), is invariably a solitary lesion, and only rarely metastasizes to the regional lymph nodes. Metastatic carcinomas, on the other hand, are frequently multiple, may involve the abdominal wall bilaterally, and frequently metastasize to the regional axillary and inguinofemoral lymph nodes. The differences between primary and metastatic carcinomas in the anterior abdominal wall may be attributed in part to the linea alba, which does not permit cross-metastases unless the tumor is situated behind the posterior rectus sheath or transversalis fascia, and in part to the predominance of lymph vessels in the deep muscular and fascial planes.

The presence of a metastatic cancer nodule in the anterior abdominal wall is a grave prognostic omen. This has been emphasized by Cullen (26). No patient in this group who harbored one or more such deposits secondary to malignant tumors somewhere in the peritoneal cavity survived more than six months, and no patient in the entire series (except those with implantation cancer) survived more than ten months.

Implantation cancer. The 8 cases of implantation cancer occurred secondary to operations for malignant tumors on the urinary bladder (3 cases), uterus (2 cases), ovary, stomach, and large

bowel. In contrast to the appalling mortality of cancers secondary to chronic draining abdominal sinuses, the mortality in this group was 50 per cent, and these patients succumbed to the primary uncontrolled tumor, recurrences, or widespread metastases, but not as a result of the tumor implant in the abdominal scar. In further contrast to cancers secondary to chronic draining abdominal sinuses, implantation cancers do not invade the peritoneal cavity. They may, however, metastasize to the regional lymph nodes. If the primary tumor has been adequately eradicated, the prognosis remains favorable for cases of implantation carcinoma, with or without surgically accessible regional lymph-node metastasis, as illustrated in the following 2 case reports:

CASE 7. Implanted gastric cancer. E.F., a fifty-five-year-old, white male, submitted to a total gastrectomy on July 22, 1941 for a huge fungating gastric cancer. His convalescence was complicated by a severe wound infection (staphylococcus aureus hemolyticus) which required secondary wound closure. Following recovery, the patient returned to work and never complained of dysphagia or of other digestive symptoms. The anatomic diagnosis was adenocarcinoma of the stomach, grade II, without node involvement, and chronic atrophic gastritis.

Two years later, a tumor implant, measuring 2.5 cm. in greatest diameter, was noted beneath the upper third of the abdominal scar and a hard, movable lymph node, measuring 3.5 cm. in greatest diameter, was palpable in the left axilla. Aspiration biopsies of both tumors revealed adenocarcinoma. The implant in the abdominal wall and its axillary metastasis were treated with high-voltage roentgen therapy as follows: 250 kv., 1.5 mm. of copper filter, target-skin distance of 50 cm., 300 roentgens daily through a 10 cm. cone for a total dose of 3000 roentgens to each tumor. No appreciable regression followed and so supplemental radium therapy was prescribed; six gold radon seeds, 1.26 mc. each, were inserted into the abdominal-wall tumor and a similar amount of radon was placed in the axillary mass. The tumors did not regress.

On November 17, 1943 the tumor implant was widely excised down to the parietal peritoneum, which necessitated the removal of a considerable portion of the posterior rectus sheath to which it was attached, and a radical axillary dissection was performed at the same time. Convalescence was uneventful. The patient has remained well.

Microscopic examination of both specimens revealed adenocarcinoma.

CASE 8. Implanted cancer of the cervix uteri. T.P., (para-8, gravida-9) was a forty-year-old Italian housewife with a history of irregular vaginal bleeding during the last trimester of her most recent pregnancy. A diagnosis of placenta previa was made by her obstetrician. During the eighth lunar month a 1 cm. granular erosion was noted on the anterior lip of the cervix uteri, biopsy of which revealed epidermoid carcinoma. A classical cesarean section was performed immediately and a normal viable infant was delivered. Placenta previa was confirmed at operation.

The patient was referred to the Memorial Hospital on March 20, 1937 (sixth postpartum week) for treatment of the uterine cancer. Examination disclosed a carcinoma of the cervix, stage 2 (League of Nations Classification). Treatment consisted of external irradiation to the pelvis, employing the following factors: 198 kv., 0.5 mm. of copper filter, target-skin distance of 70 cm., 2 anterior and 2 posterior portals (each measuring 14 by 11 cm.), 250 roentgens daily for a total dose of 1750 roentgens to each of the 4 portals. On completion of this cycle, a colpostat was placed in the vagina for 2,500 millicurie hours, followed by a cervix tandem for 3,000 millicurie hours. The cervical tumor regressed satisfactorily and there has never been any evidence of recurrent disease or metastasis.

On April 16, 1938, a 1.5 cm. nodule was noted beneath the distal third of the laparotomy scar, evidently a tumor implant. The mass was excised and the pathological report was epidermoid carcinoma. The patient has remained well to the present time (six years).

Comment. In cases of implantation cancer, a favorable prognosis can be expected if the primary tumor has been adequately eradicated. The second case is distinctly unusual in that the tumor implant resulted from a cesarean operation for placenta previa in a patient harboring a cancer of the cervix.

TABLE V.—MALIGNANT LYMPHOMAS IN THE ANTERIOR ABDOMINAL WALL

Type of tumefaction	Cases
Total	22
Lymphosarcoma	16
Hodgkins disease	3
Mycosis fungoides	2
Chronic lymphatic leucemia	1

Malignant lymphoma. These tumors occur in the anterior abdominal wall far more often than indicated in Table V. In most instances the disease is either widespread or the diagnosis is firmly established by the time the tumors appear in this soft-somatic-tissue structure. In 22 cases, however, the first indication of lymphosarcoma, Hodgkins disease, leucemia, or mycosis fungoides was tumefaction in the anterior abdominal wall. This is a rare initial manifestation of the lymphomatoid diseases because during the period from 1917 through 1943 more than 1,100 cases of malignant lymphoma were seen at the Memorial Hospital. The lesions varied from a shotty subcutaneous nodule to bulky intramural masses. In all cases, further investigation revealed lymphomatoid disease affecting other tissues or organs. Malignant lymphomas are merely mentioned in this monograph for reasons of differential diagnosis. The correct diagnosis may be made only by histological studies of material obtained from the tumor.

MISCELLANEOUS LESIONS SIMULATING TUMORS IN THE ANTERIOR ABDOMINAL WALL

Not infrequently, a non-neoplastic process produces tumefaction in the anterior abdominal wall which may simulate true neoplasia. Such a process may be cystic, specifically inflammatory, nonspecifically inflammatory, degenerative, or traumatic in nature. There were 79 cases of this

TABLE VI.—MISCELLANEOUS LESIONS PRODUCING TUMEFACTIONS IN THE ANTERIOR ABDOMINAL WALL

Pathological process		Cases
Total		79
Chronic inflammation		21
Cysts		24
Sebaceous cyst	22	
Urachal cyst	1	
Sweat-gland cyst	1	
Radiation ulcer		8
Fat necrosis		8
Pyogenic granuloma		4
Tuberculosis		4
Endometriosis		4
Verrucae vulgaris		3
Boeck's sarcoid		2
Spontaneous hematoma		1

type in our series (Table VI). They comprise 16.8 per cent of tumefactions in this locality.

The most common non-neoplastic lesions are cysts (sebaceous, urachal, and sweat-gland) and chronic nonspecific inflammatory masses. Less often encountered are nonmalignant radiation ulcers, fat necrosis, tuberculosis, and endometriosis. There were 2 cases of Boeck's sarcoid, and 1 instance of the rare spontaneous hematoma in a female patient.

Aspiration biopsy should be of special value in this group of non-neoplastic lesions because many of them do not require surgical management and an established anatomic diagnosis would enable the surgeon to proceed with a more conservative plan of treatment.

Nonspecific chronic inflammatory tumors and tuberculosis in the tissues of the anterior abdominal wall are of interest to the oncologist particularly from the point of view of differential diagnosis. They have been adequately described by Namikawa and Sugai (78). Umbilical endometriosis and endometriosis in laparotomy scars have the same significance for the tumor therapist. Comprehensive reports dealing with endometriosis of the abdominal wall have been published by Pratt (93), Maes (63), Schauffler (104), Masson (69), and others. Hydatid cysts in the anterior abdominal wall described by Adams (1), Gowland (41), Négrié and Rolland (80), and Lanos (56), and dermoid cysts, reported by Taylor (118), Rispal and De Verbizier (96), and Schwarz (107), were not encountered in the present series. Unusual lesions in the anterior abdominal wall, like fungus tumors (91) or Schloffer's tumors (65 and 105), were not seen.

There was, however, 1 case of spontaneous hematoma in a female patient. This rare, interesting syndrome has been described by Wiener (128), Taylor (117), Fothergill (38), and Maxwell (71). It occurs in young women, frequently during, or shortly following, pregnancy. There is usually no preceding history of trauma. In most instances, the tumefaction develops slowly, but it may appear suddenly and may even simulate an acute intra-abdominal episode. Such lesions are invariably situated in the lower anterior abdominal wall beneath the deep fascia and may attain considerable proportions. This tumefaction is frequently mistaken for a desmoid tumor because of its location and its relation to pregnancy. The etiology is obscure. Treatment consists of incision and evacuation of the hematoma.

Our case was unique in that the overlying skin contained a moderate-sized nevus unius lateris (neuropathic papilloma). The hematoma was drained through an incision well below the site of the skin tumor, which was simultaneously excised.

PART II

DESMOID TUMORS

INTRODUCTION

The desmoid tumor has been firmly established as an anatomic and clinical entity. The morphology of this neoplasm was first described by Macfarlene (62) in 1832. The term "desmoid" (δεσμις band εἰδος appearance) was introduced into the literature by Mueller (77) in 1838 because he was impressed with the dense, tendon-like consistency of the tumor. During the past fifty years, comprehensive reports on tumors of the desmoid group have been published by Ledderhose (57), Pfeiffer (90), Powers (92), Stone (112), von Klot (53), Stewart and Mouat (111), and others.

Definition. Desmoid tumors are essentially hard fibromas, situated in the flat muscles of the anterior abdominal wall, characteristically occurring in young parous women and frequently recurring following limited surgical removal. More specifically, the tumor is an unencapsulated, infiltrating fibroma of fascial or aponeurotic origin, with a microscopic appearance which varies from that of an acellular fibroma to that of a cellular, low-grade fibrosarcoma. Similar growths located in skeletal muscle other than in the abdominal wall have been included in the desmoid group by certain authors, particularly by Nichols (81), Mason (68), Waugh (125), and Pearman and Mayo (88). This extends the definition of Mueller to include all fibromas infiltrating muscle and nonmetastasizing fibrosarcomas of the fascia-tendon-aponeurotic type.

ETIOLOGY

Incidence. Desmoid tumors are rare. This can be judged by the fact that Cabot (23) encountered only 3 such tumors in 4,876 tumor cases; Andrews (3 and 4) reported 2 cases among several thousand laparotomies; Stone (112) described 5 cases in a series of 21,000 surgical patients at Johns Hopkins Hospital, and Guerlt's collection (46) of 16,637 tumor cases from the Vienna hospitals contained only 0.13 per cent of desmoid tumors.

From 1917 to 1943, inclusive, 17 desmoid tumors of the abdominal wall were encountered at the Memorial Hospital and during this period 50,346 cases of neoplastic disease were admitted to the hospital (first admissions), which made a gross hospital incidence of 0.03 per cent. In this series, desmoid tumors comprise 3.5 per cent of all tumefactions, 4.2 per cent of all true neoplasms, 5.5 per cent of all primary tumors, and 7 per cent of all benign tumors in the anterior abdominal wall (Tables I and II).

Causative factors. No definite common causative factor for this tumor could be determined. In no case could a definite history of trauma be elicited, nor were there any evidences of neurofibromatosis, keloidal tendencies, or any allied manifestations of an overdevelopment of connective tissue. Although desmoid tumors which arise in laparotomy scars have been reported by Andrews (3 and 4), Danforth (29), Nichols (81), and Bessesen (11), no such instance occurred in the series here reported.

The one factor that appears to be of etiological significance in the causation of desmoid tumors is pregnancy. With but 1 exception, all the female patients in this series (15) had had a recent gestation. These patients had borne at least one child and in the majority of cases the tumor was first noted during pregnancy or within the first year following delivery (Table VII). The hypothesis has been advanced that the tumor in female patients may arise on the basis of an unhealed injury to the abdominal wall sustained during pregnancy or parturition, but when it is encountered in infants, children, and nulliparous women, as well as in laparotomy scars, it suggests an anatomic predisposition to tumor growth in this region. The injury during pregnancy conceivably could be the tension or spreading of fascial or aponeurotic fibers which occurs in somewhat the same fashion as the more superficial striae gravidarum are produced.

Geschickter (40) has assayed various fibrous tumors for estrogens and gonadotropic substance. He found 13,000 rat units of gonadotropic substance per kilogram of tumor in a desmoid tumor of the abdominal wall, but did not find any estrogen; he suggested, therefore, that the neoplasm has the power to concentrate gonadotropic substance. Aschheim-Zondek tests, or their equivalents, have apparently never been carried out in patients who harbor desmoid tumors. There are no further data available to reveal a more specific sex-endocrine relationship and there is no case on record which has been treated by the administration of sex hormones.

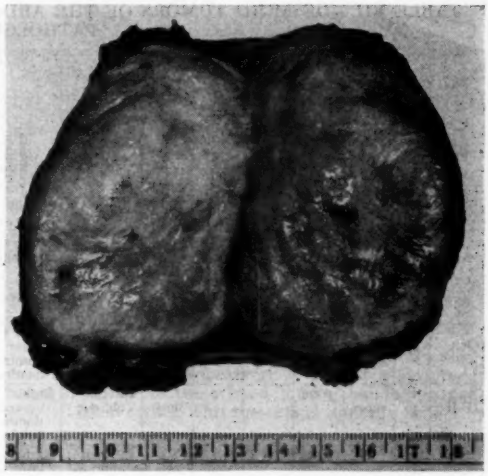

Fig. 9. Bisection of a circumscribed type of desmoid tumor. Muscle tissue is attached to both poles of the tumor.

CASE 9. Desmoid tumor of the anterior abdominal wall. The eighteenth case in this series of desmomas was admitted to the Memorial Hospital on February 10, 1944. It is not included in the statistical tables which cover the period 1917 to 1943, inclusive.

The patient was a thirty-two-year-old, white female (para-2, gravida-2) with a history of a painless mass in the abdominal wall of six months' duration. The second childbirth occurred two and a half years before the growth was first noted and a cholecystectomy for calculi had been performed six months prior to the appearance of the tumor. She was referred with a diagnosis of desmoid tumor, which was based on an incisional biopsy. Examination revealed a hard, infiltrating, intramural tumor situated in the right upper abdominal quadrant beneath a well healed laparotomy scar. The Aschheim-Zondek test (Friedman modification) was negative.

Surgical exploration disclosed a hard, bulky, unencapsulated tumor which practically replaced the right rectus abdominis. A considerable portion of the posterior rectus sheath and parietal peritoneum, to which the growth was densely adherent, had to be resected. Primary closure was effected without difficulty. The tumor measured 12 by 8 cm., and microscopic examination revealed the usual structure of the desmoid tumor.

The entire specimen was submitted for bioassays to the laboratory of Dr. Konrad Dobriner, steroid chemist of the

TABLE VII.—DESMOID TUMORS OF THE ABDOMINAL WALL; TABULATION OF CLINICAL AND PATHOLOGICAL DATA

Case number	Sex and age of patient	Duration of tumor	Size of tumor	Number of pregnancies	Number of childbirths	Postpartum interval before appearance of tumor	Muscles involved	Topographical distribution	Osseous attachment	Peritoneal involvement	Recurrences prior to admission	Recurrences after excision at Memorial Hospital	Recurrences following pregnancy	Malignant transformation	Response to irradiation (recurrences)	Follow-up period (in years)	End-results
1 A.B	F 23	7 yrs.	Entire abdominal wall	3	3	1 yr.	Recti abdominis	Lower abdominal wall Bilateral	+	+	2	1	+	+	±	3	Tumor controlled, then patient lost to observation
2 I.B.	F 25	4 mos.	10 cm.	2	2	4 mos.	External oblique	Right lower abdominal quadrant	0	+	0	2	0	0	+	10	Controlled
3 F.H.	F 30	3 mos.	5 cm.	2	2	3 mos.	Internal oblique	Right lower abdominal quadrant	0	0	0	1	+	0	−	16	Cured
4 F.L.	F 32	5 yrs.	19 cm.	1	1	5 yrs.	Internal oblique	Right lower abdominal quadrant	+	+	0	0	0	0	−	4	Cured
5 A.R.	F 29	1 yr.	10 cm.	4	4	3 yrs.	Latissimus dorsi	Right lower abdominal quadrant	0	0	0	0	0	0	−	16	Cured
6 M.H.	F 34	1 yr.	12 cm.	2	1	7 mos.	Rectus abdominis	Right flank	+	0	0	0	0	0	−	7	Cured
7 M.G.	F 30	3 mos.	8 cm.	1	1	1 yr.	Transversalis	Left lower abdominal quadrant	0	0	0	0	0	0	−	12	Cured
8 J.M.	M 44	4 yrs.	5 cm.	−	−	−	Rectus abdominis	Right upper abdominal quadrant	0	0	2	0	−	+	0	9	Cured
9 M.D.	F 31	9 mos.	5 cm.	1	1	6 mos.	Rectus abdominis	Left lower abdominal quadrant	0	0	0	0	0	0	−	8	Cured
10 M.F.	F 22	1 yr.	6 cm.	1	1	3 yrs.	Rectus abdominis	Left lower abdominal quadrant	0	0	1	1	0	0	+	7	Cured
11 G.M.	F 30	5 mos.	4 cm.	1	1	1 yr.	External oblique	Right lower abdominal quadrant	+	0	0	0	0	0	−	5	Cured
12 T.R.	F 26	9 yrs.	20 cm.	0	0	−	?	Right upper and lower quadrants and left lower quadrant	+	+	0	−	−	0	±	5	Controlled
13 M.A.	F 23	2 yrs.	10 cm.	1	1	During gestation	Rectus abdominis	Right lower abdominal quadrant	0	+	1	0	0	0	−	4	Cured
14 L.K.	M 64	2 yrs.	7 cm.	−	−	−	Rectus abdominis	Right lower abdominal quadrant	0	0	6	0	−	+	−	3	Cured
15 D.R.	F 25	6 mos	5 cm.	2	2	1 mo.	Rectus abdominis	Left paraumbilical region	0	0	0	0	0	0	−	2	Cured
16 E.S.	F 31	1 yr.	8 cm.	2	2	3 mos.	Rectus abdominis	Left lower abdominal quadrant	+	+	1	0	+	0	−	1	Cured
17 F.B.	F 24	8 mos.	4-5 cm.	2	2	2 mos.	External oblique	Left lower abdominal quadrant	+	0	0	0	0	0	−	½	Cured

Memorial Hospital, who found 2 units of prolan A per gram of dried tumor (1 gm. of dried tumor would equal about 4 gm. of fresh tumor). Therefore, it may be said that each kilogram of fresh tumor tissue (desmoma) contained approximately 250 units of prolan A.

The wound healed per primam, and follow-up examinations revealed no evidence of recurrent tumor.

PATHOLOGICAL ANATOMY

Gross pathological anatomy. As its name implies, the desmoid tumor is a dense, hard, fibrous growth which may be circumscribed (Fig. 9) or diffusely infiltrating (Fig. 10) in type. In either case, it characteristically compresses and invades muscle. It is almost always solitary and unilateral. If the tumor is circumscribed, the shape is usually round or oval and the long axis of the mass is parallel to the long axis of the muscle involved. This peculiarity can be explained by the well known tendency of tumors to grow in the line of least resistance. The circumscribed type contains no true capsule. The diffusely infiltrating type may extend into the flat muscles for a considerable distance, occasionally producing multiple tumors and rarely involving the abdominal wall bilaterally (Cases 1 and 12)[1]. The tumors were at no time attached by a pedicle. Generally, neither the anatomic type nor the size of the tumor was in any way related to its cellular structure. Our specimens varied from 5 to 20 cm. in greatest diameter. The largest tumor recorded in the literature, by Rokitansky (98), weighed 17 kgm. The tumor is usually white but may be yellow or gray. The surface is smooth or nodular and a crisp, grating sound is produced when the mass is cut.

Although no true "bone pedicle" was demonstrated in any of our cases, these tumors—as their counterpart in striated muscle outside of the abdominal wall—show a tendency to infiltrate into joints and to become adherent to bone. In Pfeiffer's series (90), 16 per cent of the cases showed periosteal attachment, while in our series the tumors were found to extend to the periosteum of the pelvic bones in 41 per cent of the cases. They were most usually attached to the inner surface of the iliac crest. Occasionally a growth was densely adherent to the transverse processes of the adjacent vertebrae or to Poupart's ligament. Not infrequently, the parietal peritoneum becomes involved by the tumor, but only rarely does the growth penetrate into the peritoneal cavity (Case 1). Those desmoid tumors which have their origin in the posterior rectus sheath or in the transversalis fascia are the growths most liable to become firmly attached to the parietal peritoneum. It is generally stated that desmoid tumors do not extend through the subcutaneous tissues to involve the skin. In Cases 8 and 14 the tumor ulcerated through the skin of the abdominal wall and produced a crater of considerable dimensions. Both patients were males and both neoplasms had undergone malignant transformation.

[1]All case numbers used in Part II of this report refer to our own series (See Table VII).

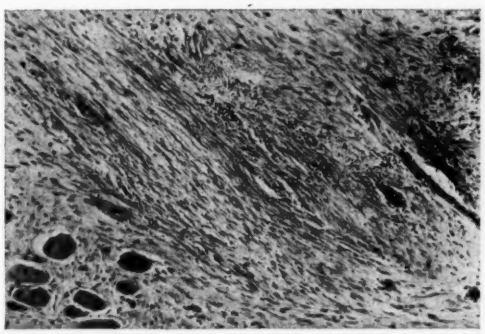

Fig. 10. A desmoid tumor which has undergone malignant transformation. Appearance is that of a low-grade fibrosarcoma. Note compressed muscle bundles in the lower left-hand corner. This tumor was clinically benign.

The muscle which was most frequently the site of this specific neoplasia was the rectus abdominis. The external and internal oblique muscles were next most frequently involved. The neoplasm was confined to the transversalis muscle in one case and to the latissimus dorsi in another. Occasionally several muscles were affected because of the infiltrating tendency of this neoplasm.

The vascularity of desmoid tumors is generally poor, but unlike other tumors with a scant blood supply, these neoplasms do not undergo necrosis or liquefaction, and this may be attributed to the essentially fibrous nature of the tumor. A desmoid tumor which has undergone extensive malignant transformation is usually soft in consistency, relatively vascular, and is the one most liable to produce cutaneous ulceration.

Histopathology and histogenesis. The microscopic appearance of the desmoid tumor is that of a fibroma plus the presence of bundles of striated muscle fibers in various stages of atrophy. The histological picture may vary from that of an acellular fibroma to that of a cellular, low-grade fibrosarcoma. Very often, the structure strongly resembles that of a neurofibroma because of the presence of intertwining fibrils and cells, but microscopic study following special silver staining reveals that the neuromatous pattern is produced by fibroblasts and their interlacing fibrils rather than by fibroglial fibrils.

It is not uncommon to encounter areas of fibrosarcomatous and myxosarcomatous transformation in this group of neoplasms, and, rarely, a tumor may have the appearance of a low-grade fibrosarcoma throughout. It is significant that among cases previously reported, malignant transformation was particularly common in males. Of the 3 cases of malignant transformation in the present series, 2 occurred in males and 1 in a female patient. There is no relation between the size of the tumor and the incidence of malignancy, nor could a definite conclusion be drawn either from an analysis of this series of cases or from a survey of the literature on the relation of the duration of the tumor to the incidence of malignant transformation.

The histogenesis of desmoid tumors has been established since the days of Mueller: i.e., that the neoplasm arises from the fibroblasts of the deep fascial and aponeurotic structures of the anterior abdominal wall. Although Ewing (37) has called attention to the strong but superficial resemblance of these tumors to neurofibromas, there is no evidence to support any histogenetic relation between these two neoplasms.

Desmoid tumors versus fibromas. The desmoid tumor differs from the ordinary fibroma in that it is often unencapsulated, possesses infiltrative tendencies, and attains considerable size. Characteristically, the desmoid tumor always compresses, invades, and destroys muscle. The usual, encapsulated fibroma is never aggressive. Tumors of the desmoid group occasionally contain foci of sarcomatous transformation. While simple fibromas are largely situated subcutaneously, desmoid tumors invariably have their origin in the deep fascial and aponeurotic structures of the anterior abdominal wall. Desmoid tumors commonly recur following limited surgical excision, while fibromas do not.

DIAGNOSIS AND CLINICAL COURSE

There are no special symptoms characteristic of desmoid tumors. The mass is usually first noted by the patient or discovered during routine abdominal examination. Pain, although infrequent, is dull and centered over the tumor site. The tumor is always slow-growing and of relatively long duration. It occurs most often in gravid or parous women, making its appearance during gestation or, more usually, within the first year following childbirth (Table VII). If noted during pregnancy, the mass does not regress after delivery; on the contrary, growth is progressive.

In the majority of our cases, the neoplasm was located within the right lower abdominal quadrant and only rarely crossed the midline. The significance of this topographic distribution, although of diagnostic import, is difficult of evaluation. Since the tumor is deeply situated and only rarely shows a tendency to extend to the subcutaneous tissues and skin, the mass may have reached considerable proportions when first seen by the examiner, the average size at the time of admission being 8 by 10 cm. in the greatest diameter. The tumor is usually fixed, nontender, and solitary. Since the mass is located intramurally, Bouchacourt's sign may be demonstrated in almost every case. This may be revealed by having the patient contract the muscles of the anterior abdominal wall by flexing the head; following this maneuver, an intraperitoneal mass can no longer be palpated or, only very slightly, but an intramural mass becomes more prominent. Occasionally, it is difficult to determine by physical examination alone whether the tumor is situated in the abdominal wall, peritoneal cavity, or retroperitoneal space. Under such circumstances, surgical exploration must be resorted to before the exact location of the neoplasm can be established. Whenever a deep-seated tumor of the lower anterior abdominal wall is encountered in a young parous female, especially if it is related to a recent gestation, a presumptive diagnosis of desmoid tumor is justified.

Aspiration biopsy proved of no positive value as a diagnostic measure in this group of tumors. The procedure was performed in 5 cases and repeated in 1 case, with negative reports in all. Because of the essentially fibrous nature of the neoplasm, one would not expect it to yield tissue on aspiration which would be sufficiently characteristic for microscopic identification. This diagnostic aid should not be omitted, however, even when the possibility of desmoid tumor is being entertained, for one might be dealing with a neoplasm of which the histological structure can be determined by aspiration biopsy and which might not best be treated by primary radical surgical excision: viz., liposarcoma, lymphosarcoma, metastatic carcinoma, or tuberculosis.

Desmoid tumors are slow-growing. Growth, however, is progressive and if of sufficient duration (from seven to ten years), the neoplasm may reach huge proportions, involve the entire abdominal wall, and penetrate into the retroperitoneal space or even into the abdominal cavity and pelvis. These tumors may become adherent to the umbilicus, Poupart's ligament, or the periosteum of the pelvic bones. They occasionally undergo malignant transformation into low-grade fibrosarcoma, but they never involve the regional lymph nodes or produce distant metastases. The

incidence of malignant transformation is particularly high in male patients. One of the striking clinical characteristics of desmoid tumors is their tendency to recur following local surgical excision. One-fourth of our patients gave a history of from one to six recurrences following surgical removal elsewhere, before admission to the Memorial Hospital. In this series, recurrences were especially frequent during subsequent pregnancies and following subsequent childbirths (Table VII).

TREATMENT

The treatment of choice for operable desmoid tumors is radical surgical excision. This was advocated as long ago as 1899 by Bouffieur (19). Successful resection of the parietal peritoneum for desmoid tumors was first performed by Saenger (101) in 1884.

Adequate surgical management of the neoplasm may necessitate resection of a considerable portion of the abdominal musculature, underlying parietal peritoneum, periosteum of the pelvic bones, the adjacent vertebral ligaments, or the splitting of Poupart's ligament. Although the neoplasm is essentially benign, local recurrences are frequent so that excision must be wide and complete.

The parietal peritoneum is sufficiently elastic so that closure following peritoneal resection is not technically difficult. Large fascial defects may be adequately closed by suture in a transverse direction (as in the Mayo repair for umbilical hernia) or even by use of fascial transplants. The fascia should always be overlapped to prevent postoperative hernia. The elasticity and frequent redundancy of the anterior abdominal wall, especially in parous women, facilitates considerable stretching so that closure of large defects may be effected without undue tension. It may occasionally become necessary, especially in male patients, to resort to a sliding muscle graft brought over from the flank.

Since adequate surgical treatment of desmoid tumors usually results in considerable loss of fascial and muscular structures of the anterior abdominal wall, the patients require at least four weeks of postoperative bed rest. It has been our policy to keep the lower limbs flexed by means of pillows, bed adjustment, or an overhead knee sling so that the broad abdominal muscles remain continually relaxed during the period of healing. Daily enemas and prompt treatment of cough are necessary measures in the after-care.

Patients should be warned against subsequent pregnancies because of the high incidence of recurrences following childbirth.

Radiation therapy. According to Ewing (37), the majority of these tumors respond slowly but satisfactorily to irradiation. This statement apparently has not been generally accepted for most reports on desmoid tumors either mention no experience with roentgen therapy for this neoplasm or state that the growth did not respond to irradiation (Mason (68), Mankin (64), and Pearman and Mayo (88)). In the present series, there were 3 inoperable cases which were satisfactorily controlled with high-voltage roentgen or radium-element pack therapy. Almost all recurrences were treated successfully with high-voltage roentgen-ray therapy. The only recurrence which was treated unsuccessfully with irradiation was in a male patient (Case 8). Many of our cases received preoperative roentgen or radium-element pack therapy, as it is a policy of the Mixed Tumor Service to prescribe such preliminary treatment for almost all soft-somatic-tissue sarcomas—this was the most frequent preoperative diagnosis made for the desmoid tumor in this clinic.

It is difficult to understand why such a large proportion of desmoid tumors should respond to high-voltage radiation therapy. There is nothing in the histological structure of the neoplasm to suggest radiosensitivity. Muscle-infiltrating fibromas and nonmetastasizing fibrosarcomas of the fascia-tendon type in locations other than the anterior abdominal wall either cannot be controlled by large doses of irradiation or respond feebly and inadequately to such treatment. This suggests, then, that the response of desmoid tumors to irradiation may be an indirect one, i.e., due to suppression or cessation of ovarian function (radiation castration). Such a hormonal hypothesis may also explain why a small dose (from 1,000 to 1,500 roentgens) directed to the tumor site does not retard the growth and that larger doses (of at least 5,000 roentgens and the portal to include the entire lower abdomen) are necessary to effect complete regression or satisfactory control of the tumor. The radioresistance of the neoplasm in males supports this hypothesis.[1] The following case illustrates the importance of radiation castration in the management of inoperable desmoid tumors:

CASE 10. Radiation castration treatment of inoperable desmoid tumor. T.R., a twenty-eight-year-old, white

[1]Based on this hypothesis, we have recently submitted a female patient, aged thirty-eight, to radiation castration for an advanced, inoperable, extensively ulcerated, nonmetastasizing fibrosarcoma of the fascia-aponeurotic-tendon type (morphologically analogous to a desmoid tumor which has undergone malignant transformation and with clinical characteristics that strongly resemble those of the desmoma). This tumor is situated in the interscapular region and extends into the vertebral ligaments, which was ascertained by surgical exploration. Although the necrotic defect is filling in slowly by granulation and the condition has greatly improved, it is still too early to indicate whether suppression of ovarian function has inhibited the growth of this neoplasm.

Puerto Rican female, was seen at the Memorial Hospital on August 21, 1936 for a painless abdominal mass which was first noted in 1930. The patient married one year after the appearance of the tumor but never succeeded in becoming pregnant. The mass slowly increased in size and when surgical excision was attempted by her local surgeon in 1936, the growth was found to be adherent to the ilium and to extend into the retroperitoneal space. It was regarded as inoperable. Microscopic examination of tissue removed for biopsy revealed the usual structure of fibroma. At this time, six x-ray treatments were given to the tumor site (factors and dosage unavailable) with no apparent regression of the mass.

Physical examination disclosed a hard, smooth, fixed, bulky tumor arising in the right lower quadrant of the anterior abdominal wall and extending up to the right costal margin, slightly past the umbilicus on the left. It appeared to invade the retroperitoneal space on the right side. Excretory pyelograms showed a nonfunctioning right kidney and on cystoscopic examination the right ureteral orifice could not be identified. Kidney function tests, however, showed no evidence of renal insufficiency. Menstruation was within normal limits.

In September, 1936 a cycle of high-voltage roentgen therapy was delivered to the tumor site through upper anterior, lateral (loin), and lower anterior abdominal ports, all on the right side, using the following factors: 198 kv., 1 mm. of copper filter, target-skin distance of 50 cm., 300 roentgens to each port for a total dose of 1500 roentgens x 3. The neoplasm continued to grow and the menses were unimpaired.

During January, 1938 a cycle of pelvic irradiation was prescribed as follows: 200 kv., 1 mm. of copper filter, target-skin distance of 70 cm., 4 pelvic ports (anterior, posterior, and 2 lateral), 500 roentgens to each port for a total dose of 1,500 roentgens x 4. On completion of this treatment, the patient ceased to menstruate, the usual physiological manifestations of the menopause appeared and the neoplasm began to regress. When last examined in October 1943, the mass was limited to the right lower abdominal quadrant and measured only 8 cm. in its greatest diameter. The upper abdominal wall, the loin, and the retroperitoneal space contained no tumor on palpation. The neoplasm has been completely quiescent for four years.[1]

No case of desmoid tumor or of an extra-abdominal muscle infiltrating fibroma or nonmetastasizing fascial fibrosarcoma has as yet been treated with androgenic substances.

Radiation therapy has a definite place in the management of desmoid tumors, but is not to be preferred to primary radical surgical excision which is the treatment of choice. Radiation therapy should be reserved for inoperable cases, large tumors in poor-risk patients, and for those who will not consent to operation. Irradiation is not a satisfactory therapeutic agent in the treatment of desmoid tumors in male patients.

PROGNOSIS AND END-RESULTS

Although desmoid tumors may undergo complete malignant transformation, no instance was encountered, either in this series or in cases previously reported, in which there were regional lymph-node or distant metastases. These tumors may occasionally, however, become sufficiently aggressive to invade the abdominal and pelvic cavities and produce an inoperable and hopeless situation (Case 1). If treatment is delayed or inadequate, the neoplasm may reach huge proportions, actually replacing the anterior abdominal wall, or it may become adherent to the periosteum of adjacent bones or infiltrate into the sacroiliac joints, so as to make complete surgical removal hazardous or impossible. If dissection of the tumor and the surrounding structures is not radical and thorough, recurrences are the rule. The tumor may recur in spite of adequate surgical excision, unless a sufficient amount of preoperative or postoperative radiation has been delivered to the tumor site and its surrounding tissues (except in males). Recurrences are common during and following subsequent pregnancies.

In this series, there were 4 cases in which the tumor recurred and 1 case in which there were two recurrences. All recurrences responded satisfactorily to radiation therapy, except in 1 instance in which the patient failed to appear for follow-up examinations until the tumor had invaded the peritoneal cavity, and in 1 male patient in whom surgical excision was resorted to after an apparently adequate course of irradiation failed to control the tumor.

[1]Case 10 in Table VII.

SUMMARY

The anterior abdominal wall is presented as a surgical organ. This concept is based on experience with 391 neoplasms and 79 non-neoplastic lesions in this locality.

The lymphatic and venous components of the anterior abdominal wall, particularly of the umbilicus and its ligaments, lend themselves to the production of definite metastatic patterns with different varieties of malignant tumors. A knowledge of these anatomic patterns is a prerequisite for those called on to manage such problems.

Of the benign tumors, the plexiform neurofibroma of the von Recklinghausen type and the lymphangioma provide situations of unusual surgical interest. Of the primary malignant tumor group, the morphological types are reviewed and the treatment is outlined. Epidermoid carcinoma of the abdominal wall offers an opportunity for prophylactic cancer therapy because of specific etiological factors demonstrable in a majority of the cases. Carcinoma secondary to chronic draining abdominal fistulas and laparotomy scar sinuses—a specific clinical entity—is the most lethal type of abdominal-wall cancer.

The operation of "excision and dissection in continuity" is discussed, especially with regard to malignant melanomas and their regional nodes.

The peculiarities of metastatic cancer of the anterior abdominal wall are described and their prognostic significance is emphasized. The favorable prognosis which may be expected from tumor implants in laparotomy scars, when the primary tumor has been adequately dealt with, is pointed out.

Miscellaneous processes which produce tumefactions in this locality are listed. Some of the rare cases, like spontaneous hematoma in the female, are reported.

Desmoid tumors are presented as a clinico-anatomic entity. This presentation is based on an analysis of 17 cases which were observed and treated at the Memorial Hospital. Attention is called to their sex-endocrine relationship. An anatomic classification for these tumors is suggested. Treatment consists of radical surgical excision. A great majority of desmoid tumors respond slowly but satisfactorily to radiation therapy, but this form of treatment should be reserved for inoperable cases and poor-risk patients. A sex-endocrine hypothesis to explain the regression of desmoid tumors following adequate irradiation is advanced and evidence for its support is presented. Although these tumors are essentially benign, malignant transformation into low-grade fibrosarcomas is not uncommon. These neoplasms may rarely become locally aggressive, but have never been known to involve the regional lymph nodes or to metastasize to distant sites.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Gurdjian, E. S., and Webster, J. E.: Surgical Management of Compound Depressed Fracture of the Frontal Sinus, Cerebrospinal Rhinorrhea, and Pneumocephalus. *Arch. Otolar.*, 1944, 39: 287.

A simple fracture in the frontal sinus and its neighborhood should be treated conservatively in the absence of complicating cerebrospinal rhinorrhea or pneumocephalus. A laceration over a nondepressed or comminuted fracture in this neighborhood is also treated by the most conservative method, namely, debridement and repair of the laceration. A compound depressed fracture in the frontal sinus and its neighborhood is an operative problem. The operative rationale is to repair dural tears and thus obviate intracranial infection. Good exposure may be obtained by extension of the original laceration.

Cerebrospinal rhinorrhea associated with acute injury of the head may be treated conservatively in some cases, with success. If a compound depressed fracture of the neighborhood of the frontal sinus is present, operative repair is imperative. If roentgen examinations reveal comminution of fragments in the anterior fossa, operative repair of the cranionasal fistula is preferable if the patient's condition permits. In a case of recurrent cerebrospinal rhinorrhea of traumatic origin there should be operative repair of the cranionasal fistula. Spontaneous repair in this group is infrequent. In the presence of complicating meningitis or abscess of the brain the latter should be treated first.

Pneumocephalus may be treated conservatively with success in some cases. Pneumocephalus due to cerebrospinal or bloody otorrhea may be treated by rest in bed with little fear of infection. Frequent roentgen investigations should reveal any increase in the intracranial air. If an increase is present, operative treatment may be advisable. Pneumocephalus associated with cerebrospinal rhinorrhea is dangerous, and the treatment of choice is operative repair of the cranionasal fistula. In pneumocephalus, irrespective of the portal of entrance, operative repair is indicated when subsequent roentgen examinations show that the amount of intracranial air has increased.

LOUIS T. BYARS, M.D.

Schorstein, J.: Compound Fronto-Orbital Fractures (8 Cases). *Brit. J. Surg.*, 1944, 31: 221.

While a certain amount of controversy exists as to the need for radical operation in frontal-sinus injuries when the overlying skin has not been lacerated, there can be no debate about the necessity for immediate operation in compound fronto-orbital fractures. The wounds with which this article is concerned contain in their depths broken fragments of the walls of the paranasal sinuses and are associated with dural tears. In 6 of the 8 cases on which this report is based, early and extensive operation was performed. In all of these the dura had been torn by the trauma and in 4 the brain was severely lacerated. In the remaining 2 cases the wounds had received only superficial attention elsewhere and the patients were seen ten days and five months, respectively, after they had been injured. The data of the two groups of cases are tabulated, the individual cases are reported, and the anatomy and mechanism of the injuries are discussed.

In the group of 6 cases in which early and radical wound débridement was carried out, healing occurred by primary intention and the results were entirely satisfactory. In the 2 cases treated by superficial débridement, recovery was complicated by encephalitis and meningitis in one and by severe meningeal infection with prolonged convalescence in the other. In 4 of the cases treated by early operation, secondary grafting of bone was done from six weeks to twenty-one months after injury, because of disfigurement resulting from loss of a portion of the supra-orbital arch. The cosmetic results were satisfactory.

JOHN L. LINDQUIST, M.D.

EYE

Hollander, L., and Krugh, F. J.: Cancer of the Eyelid. *Am. J. Ophth.*, 1944, 27: 244.

Cancer of the eyelid is a common disease with an incidence of 9 per cent.

The goal of treatment is the complete eradication of the new growth in the shortest possible time, with the least amount of inconvenience to the patient, and with as little damage as possible to the eyeball and its adnexa. A variety of procedures is available for complete destruction of the new growth. Surgical procedures consist of: (1) ordinary excision; (2) removal with the so-called radioknife; and (3) destruction by electrodessication or electrocoagulation. Nonsurgical procedures consist of: (1) x-ray treatment—(a) superficial and (b) contact; and (2) radium treatment—(a) by topical application and (b) by insertion of emanation or radium needles.

Morphologically, these tumors go through the processes of crust formation, exfoliation, and reformation with sometimes minor hemorrhages which follow each other at irregularly spaced intervals.

Eyelid cancer has a multiform appearance. Clinical differentiation from tumefaction other than cancer is essential. Pigmented hair moles offer difficulty only from the standpoint of differentiation from melanocarcinomas. One can depend on their admix-

ture of brownish color and the presence of the hair-bearing areas as factors pointing against their being malignant melanotic tumors. The presence of hairs over the surface of the tumor is of inestimable value in the differential diagnosis. Vascular tumors such as hemangiomas may confuse the issue only until their composition of vascular structure is ascertained.

Classification of eyelid cancer according to microscopic appearance falls into four groups: (1) the basal-cell or hair-matrix type; (2) the squamous-cell or epidermoid type (3) the mixed-cell type; and (4) the melanoma group.

Parenthetically speaking, a completely removed basal-cell type should result in no further annoyance to the patient. However, one cannot be nearly so optimistic when one of the other three types of eyelid cancer occurs. Recurrences are not only possible, but, at times, likely; especially the so-called malignant melanotic tumors may recur.

Surgical treatment. Whenever it is possible, cancer of the eyelid should be excised. In carrying out surgical repair one must always bear in mind (1) that careful repair of the palpebral conjunctiva is imperative when it has been damaged; (2) that the proper support of the lid depends on a properly reconstructed tarsal plate; (3) that eyelid margin distortions which could cause the inversion of the cilia are to be carefully avoided; and (4) that undue scarring is followed by retractions and the formation of an entropion. Repair of lesions excised from the canthal regions offers fewer difficulties. Excision with the radioknife is a valuable method because it causes less hemorrhage and less shock and because it can be done quickly.

Nonsurgical treatment. There were a number of reasons which prompted the use of methods other than surgical: (1) the cancer was considered inoperable; (2) the patient was considered a poor operative risk; and (3) the patient refused operation. These cases were treated with some form of x-ray irradiation.

In conclusion, the authors state that they learned that no one method yielded more satisfactory results than the others and that the method of therapeutic approach depended on the extent or operability of the lesion, or the willingness of the patient to undergo certain procedures. The general impression obtained was that the most satisfactory results were obtained from scalpel excisions or contact x-rays with the use of a special shield, which was described.

LESLIE L. MCCOY, M.D.

NOSE AND SINUSES

Iglauer, S.: Two Cases of Osteomyelitis Treated with Penicillin: Case 1, Frontal; Case 2, Maxillary. *Laryngoscope*, 1944, 54: 150.

The author reports 2 cases of osteomyelitis treated with penicillin.

Ten days after a blow on the forehead, without laceration or fracture, a 12-year-old colored female was admitted to the hospital with marked swelling of the frontal region, mostly on the left side. There was a purulent discharge from the nose, puffiness of the eyes, and high fever. The patient rapidly became stuporous and incontinent. A staphylococcal bacteriemia was present. On trephine openings into the frontal sinuses, pus was found under pressure, with a communication between the sinuses. The hemolytic staphylococcus aureus was cultured.

No improvement occurred following the administration of sulfadiazine (gm. 1.0) every four hours. At a second operation on the fifth day after admission, the frontal plates of the frontal sinuses were removed. The plate on the left side was of a mushy consistency and osteomyelitis was diagnosed. Penicillin was started with a dosage of 10,000 units given intravenously every four hours. The blood culture was still positive on the following day, but thereafter it was negative. The penicillin was decreased by one-half on the fifth day of treatment and was stopped on the morning of the seventh day. A total of 340,000 units were given. Recovery was complete.

In the second case a child of three and one-half years was admitted twelve days after an injury to the forehead with marked signs of cellulitis on the left side of the face and orbit, profuse purulent nasal discharge, and swelling of the hard palate. Pus and bare bone were found on incision of the swelling of the palate, and pus came fron the sockets of two loosened teeth after extraction.

The hemolytic staphylococcus aureus was cultured from the pus and from the blood stream. Sulfonamides proved ineffective and the condition became critical on the fourth day.

Penicillin was given at the rate of 5,000 units every four hours until 100,000 units had been given. Recovery was uninterrupted.

X-ray examination did not confirm the diagnosis, but the clinical impression of the condition was that of osteomyelitis of the maxilla.

JOHN R. LINDSAY, M.D.

MOUTH

Whitcomb, C. A.: Cancer of the Lip. A Study of 56 Five-Year Cases. *Am. J. Surg.*, 1944, 63: 304.

After cancer of the skin, cancer of the lip is the commonest type of malignancy occurring in men; 148 men were treated for squamous carcinoma of the skin of the face during the same period in which 56 men were treated for cancer of the lip. Cancer of the lip in women occurs only rarely, and on the upper lip. Cervical metastasis is usually the cause of death. A five-year survival of 15 per cent of the patients who had metastasis (stages II and III), and of 83 per cent of those without metastasis was recorded by the author. The prognosis in cases of metastases from cancer of the lip is better than that in metastases from cancer of the mouth or of the throat; 1 lip cancer in 4 metastasizes to the cervical lymph nodes, and visceral metastases are rare. Death occurs as a result of uncontrolled metastases of the neck, not from cancer of the lip itself.

X-rays, radium, or surgery may be used successfully to destroy cancer of the lip. Surgery is believed to be a better method of treatment than radiation because it does not depend for its success upon the unpredictable biological reaction of tissues to irradiation, which is called radiosensitivity.

The lip cancer was excised in 41 of the 56 patients; 9 were successfully treated by radium only, and 1 patient was treated by radium and surgery; in the remaining 5, the cancer of the lip had been destroyed before admission of the patients to the hospital. Prophylactic treatment of the lymphatics of the neck by means of surgery or x-rays is not necessary because most cancers of the lip do not develop metastatic nodes. Follow-up examination of the neck is a more ideal form of treatment. Movable metastatic nodes are treated, by choice, by block dissection of the cervical lymphatics. The cancer cells in lymph nodes can be destroyed by the combined effect of x-irradiation and radon implants—rarely, if ever, by external irradiation alone; but the disease in the neck may be cured by combined irradiation only if no new metastatic nodes develop in the implanted area or elsewhere in the neck.

Fixation of large submaxillary metastases from lip cancer is sometimes due to tension of the walls of the submaxillary space rather than to the invasion of the mandible or floor of the mouth. This type of fixed metastasis is operable.

Fortunately, bilateral submaxillary metastases from lip cancer are not necessarily simultaneous. A difference in the time of appearance of nodes on the two sides of the neck permits convalescence from one neck dissection before operation is needed on the other side of the neck. JOSEPH K. NARAT, M.D.

Wiesenfeld, I. H., and Meadoff, N.: Fractures of the Mandible. *Permanente Foundation Medical Bulletin*, 1944, 2: 49.

While the mandible is a strong bone with a thick cortex and well developed spongiosa, the presence of sockets for the teeth in the body constitutes a source of weakness so that the lines of fracture tend to pass through the sockets. The sockets of unerupted teeth fall in the same category so that, for example, fractures of the angle of the mandible frequently pass through the area about an unerupted third molar. Fractures involving the ramus of the mandible are infrequent as the bone is relatively strong here and not weakened by the presence of tooth sockets or unerupted teeth. Of even more importance, however, in protection of the ramus is its muscular sling composed of the masseter muscle laterally, and the internal pterygoid and temporal muscles medially. The mandibular condyle is relatively denser than other parts of the bone so that fractures rarely extend through the neck of the condyle. In the edentulous mandible the sites of lessened resistance are the neck of the condyle and the angle, so that these areas are frequently the location for compensating secondary fractures when trauma is applied anteriorly. They supervene frequently when a fracture does not occur at the primary site of violence. It is also true that a certain amount of atrophy of the alveolar ridge occurs in the edentulous mandible, which relatively weakens its resistance to external force.

The displacement accompanying any fracture of the mandible is largely the physical resultant of the muscular forces involved. The direction of trauma and gravity play lesser roles. Under physiological conditions nine muscles are in a well balanced relationship. These fall into three groups on the basis of their action: the elevators (masseter, temporal, internal pterygoid), the depressors (mylohyoid, geniohyoid, genioglossus, digastric, platysma), and the rotator (external pterygoid).

The displacement accompanying a given fracture is readily explicable. In fractures through the molar and angle regions, the posterior fragment under the control of the elevators is displaced upward and laterally with the deformity limited by the occluding forces in the presence of teeth. The anterior fragment under the unopposed action of the depressors is displaced downward, medially, and backward. Fractures of the premolar region which are vertical have the posterior fragment displaced upward chiefly through the action of the masseter muscle, and the anterior fragment is displaced downward by the depressor muscle group. When, however, the line of fracture is oblique, displacement is more marked and accentuated by the overlapping of fragments associated with the pull of the external pterygoids. Fractures in the region of the symphysis under the action of the mylohyoid muscles chiefly have a tendency toward outward rotation of the fragments which causes separation at the anterior ends of the fracture site. The only muscle attached to the condyloid process is the external pterygoid. Thus in fractures through the neck of the condyle there is a resultant displacement forward onto the eminentia articularis. The adjacent portion of the ramus approximates the glenoid fossa more closely than normal so that the mandible deviates toward the side of the fracture. In fractures of the coronido process the displacement is associated with action of the temporal muscle, usually in an upward and backward direction.

The most common single site of fracture was found to be the body of the mandible, followed closely by the angle. Fractures of the coronoid process and ramus were the least frequent. Practically all fractures in the dental arch of the mandible were compounded intraorally and involved tooth sockets. The method of treatment chosen must be the best and the one which most rapidly restores the individual case to its original functional state. Five essential requirements should be observed in selecting a method of treating mandibular fractures: immobilization of the fragments, occlusion of the teeth, simplicity of application, cleanliness, and comfort.

The usual fractures with little displacement and with serviceable teeth on both sides of the fracture line and on the maxilla present few problems in

treatment. Our experience is in accord with that generally prevalent in the literature, namely, that results are excellent with early reduction and immobilization by interdental and intermaxillary wiring.

Review of the recent literature confirms the authors' enthusiasm for skeletal fixation in selected cases of fracture of the mandible. It is easily applied, maintains immobilization, and permits ready access to the parts for further reduction when needed. Complete function of the mandible is retained with a minimum of nursing care and no feeding or nutrition problem. There is no concern in these cases regarding nausea or vomiting. The technique for reduction of a displaced posterior fragment is simplified. The armamentarium of the oral surgeon is fortified so that he is able to treat a fractured mandible in the presence of a fractured maxilla. In extensive injuries of the face with loss of bony segments, external skeletal fixation is readily applicable for maintenance of space to facilitate later plastic or graft surgery. Tooth extraction can be done whenever indicated.

Nevertheless, while there is now a tendency to use external skeletal fixation in many fractures which are amenable to other conservative forms of therapy, it is to be remembered that certain dangers are inherent in inserting pins into the mandible. Our experience would indicate that the results with interdental and intermaxillary wiring are quite good, particularly with regard to occlusion, and whenever possible these should be employed. However, external skeletal fixation should be reserved for: badly displaced fractures of the edentulous mandible, fractures posterior to the dental arch, multiple fractures involving both the mandible and maxilla, mandibular fractures wherein air or sea transportation or a condition such as bronchiectasis contraindicate closing the teeth in occlusion, comminuted fractures of the mandible with destruction of a bony section in which the fragments cannot be held adequately by dental splints, fractures through the area of the symphysis mentis (with comminution and displacement) which are not effectively fixed in the reduced position by dental wiring or arch bars, fractures with considerable displacement, those compounded into the mouth, and those with infection and local sloughing in which there has been delay in treatment. It should also be used when the opportune time for interdental or intermaxillary fixation has passed.

LOUIS T. BYARS, M.D.

PHARYNX

Thompson, C. M., and Grimes, E. L.: Carcinoma of the Nasopharynx. *Am. J. M. Sc.*, 1944, 207: 342.

Carcinoma of the nasopharynx usually remains unrecognized until the disease is advanced.

Seventeen cases are described, all of which were in the late stages on admission.

The mean age was thirty-eight and five-tenths years, 15 patients being males and 2 females. Two cases occurred in Chinese, 4 in negroes, and 11 in whites. Cervical lymph-node metastases were present on admission in every case.

Epistaxis occurred primarily in 3 and eventually in 10. Tinnitus or deafness occurred originally in 1 and later in 13; Horner's syndrome in 1 case. Cranial nerve involvement was found in 9 cases and a bony defect of the middle fossa on roentgen examination in 5 cases. The average length of time from the first symptom to diagnosis was eight and one-tenth months, and the average length of life in 15 cases was twenty-three and four-tenths months. Two patients were living two years after diagnosis. The tumors were all classed as carcinomas although some presented characteristics corresponding to "lymphoepithelioma" as described by Schmincke.

The tumors invaded the base of the skull along the internal carotid artery and metastasized to the cervical nodes. One group comprising about one-fourth of the total metastasized to the lungs and liver.

The treatment is irradiation. The primary growth is radiosensitive, but secondary growths are radioresistant.

JOHN R. LINDSAY, M.D.

NECK

Diaz. J. L.: Healing by First Intention in Laryngectomies (La curación por primera intención en la laringectomía). *Acad. argent. cirug.*, 1943, 27: 1119.

The author discusses an article by Ivanissevich, Ferrari, and Viacava in which they state that they have been attempting to improve the results in their laryngectomies since 1939, and that three-fourths of their laryngectomized patients are now able to swallow food by the tenth or twelfth day following the operation. Diaz deprecates their failure to provide more detailed figures in clarification of the results claimed and subdivides his own cases, including 305 laryngectomies in an experience of twenty-one years, to show that healing by first intention is neither something new, nor, given the best conditions, hard to attain. His material is divided as follows:

1. Intrinsic cancers of the larynx, without preoperative irradiation treatment or involvement of other regions of the body, in patients without thick panniculus adiposus of the neck region: 29 patients healed by first intention.

2. The same type as in 1, but with abundant panniculus: 4 first-intention cures.

3. Endo- and extra-laryngeal carcinomas which were laryngectomized together with the removal of greater or smaller fractions of the neighboring organs (pharynx or tongue): 2 pharyngoglossectomies and 1 laryngopharyngectomy healed by first intention.

4. Irradiated cancers: no cures by first intention; indeed, small doses were observed to retard cicatrization, and the patients who had received large doses of irradiation portrayed so serious a convalescence as to influence the indications for operation.

However, it seems probable that the afore-mentioned authors included in their 75 per cent of cures

by first intention, those patients whose pharyngeal suture line may have loosened somewhat, but not more than to the extent of developing a narrow sinuous pharyngeal fistula or pharyngostoma, which was insufficient to interfere with the spontaneous function of deglutition on the part of the patient by the tenth or twelfth postoperative day, and that they did not exclude from their material for this report, such patients as exhibited "at the level of the tracheostoma a mild inflammatory, suppurative, or even necrotic reaction, due to denutrition or infection coming from the trachea." By the term 'healing by first intention' they were referring only to the behavior of the suture line closing the pharyngeal operation-wound. Diaz himself does not give the number of his patients in each of his subgroups, and therefore fails to indicate his percentages of total cures by first intention.

Diaz deplores the evident intimation by the authors that, since beginning their efforts in 1939, they had accomplished such a perfectioning of the technique of laryngectomy (bismuth and arsenical therapy aimed at fusospirillar infective agents; local and general therapy with the sulpha drugs; examination of teeth, tonsils, sinuses; total conservation of the infrahyoid muscles; and two-plane suturing of the operative pharyngeal dehiscence) as to amount to a revolution in the orderly advance of surgical progress for this region, whereas such details as they record have all been well known and in practice, at least experimentally, by laryngologists for a long time in many instances.

Diaz does not seem to object strenuously to anything in connection with the operation of Babcock, or wide-field laryngectomy, except to imply astonishment that this technique as described by the authors should produce revolutionary results, but turns almost at once to the narrow-field laryngectomy, as conceived by Groove, which the authors state to be the technique most frequently employed in the United States. One of the authors seems to have tried this out on a group of patients, but it has been used by them only on a minority of patients; in fact, only one of these authors seems to have used it, and used it in the Memorial Hospital of New York. The technique used there was the one that, with minor modifications, they are at present following. Diaz objects to this technique insofar as it includes a midline incision—which he tried and then abandoned years ago. This brings the pharyngeal operative wound and the open trachea into line in the same incision wound, and failure of the wound closure results because of the immediate proximity of the two, with the consequent menace of aspiration pneumonia. Diaz himself seems to prefer a two-stage laryngectomy operation with a preliminary tracheotomy into an independent tracheotomy wound.

Another objection to Groove's operation is, in Diaz' mind, the fact that the operation is partially a laryngectomy from below upward and partially a laryngectomy from above downward. He has abandoned the latter technique because of the conviction

that the laryngectomy from below upward is not only more facile of execution, but also offers a greater certainty of total extirpation of the neoplasm and of preventing dissemination of the cancer.

In support of this contention Diaz adduces not only reported pathological findings on specimens removed at operation, and autopsy findings in those who have died of cancer of the larynx (indicating early "infiltration, at first inflammatory and later neoplastic, perhaps indeed neoplastic from the start," of the pre-epiglottic tissues extending up toward the base of the tongue which are traversed in laryngectomies from above downward), but he also cites subjective, objective, and roentgenographic methods for demonstrating such infiltration. Subjectively, the early mild pain on swallowing without laryngoscopic elucidation is explained as the deglutition displacement within this infiltrated tissue of the body and attachments of the epiglottis. This pain may be provoked also by introducing the index finger of the left hand along the patient's tongue as far as the glossoepiglottic sulcus (Figure), and applying the index finger of the right hand with gentle pressure just under the hyoid bone. Objectively, direct and indirect laryngoscopy demonstrates the edematous thickening of the structures about the epiglottis, which Diaz calls the "acartuchimiento" of the epiglottis, i.e., the infiltrated pre-epiglottic adipose body pushes the alae of the epiglottis backward, the center line being in the meantime firmly attached by the thyreoepiglottic ligament, and the x-rays show the deformity of the space between the epiglottis and the thyroid cartilages. At times this infiltration pain may be demonstrated also by imparting lateral movements to the larynx while immobilizing the hyoid bone with the fingers. Studies show that the laryngeal lymphatics traverse these tissues, so that the lightest infiltration of this area is most likely to be based on a neoplastic lymphangitis.

Diaz commends the tireless efforts of the authors in question to bring about improvement in the field of laryngectomy. JOHN W. BRENNAN, M.D.

SURGERY OF THE NERVOUS SYSTEM

PERIPHERAL NERVES

Elkin, D. C., and Woodhall, B.: Combined Vascular and Nerve Injuries of Warfare. *Ann. Surg.*, 1944, 119: 411.

Most of the large nerve trunks in the extremities are accompanied by larger blood vessels. However, very little has been said about injuries to the vessels which occur at the same time as injuries to the peripheral nerves. The missiles of this war are peculiarly adapted to causing multiple injuries in various parts of the body. Land mines, for instance, may cause as many as fifty small individual wounds. Frequently, such an injury which affects both nerve and vascular branches is overlooked with regard to one or the other; in this article five vascular lesions were discovered in patients in the hospital with only a neurological diagnosis. Furthermore, these vascular lesions have some bearing on the prognosis and treatment of the peripheral nerve lesions.

The article is divided into three parts: the first concerns cases with combined injuries of the vessels and nerves in the neck; the second, cases of injuries of the vessels and nerves in the upper extremities; and the third, cases of injuries of the vessels and nerves in the lower extremities. There were 4 cases of each type. Case histories are complete and are accompanied by instructive photographs. Attention is drawn to the well known syndrome of the last four cranial nerves, commonly known as Jackson's syndrome. These four cranial nerves and the carotid vessels may be injured in various combinations. In 3 of the cases of the neck an arteriovenous aneurysm developed and in 1 a noisy dilatation of the artery, which was entirely relieved by release of the vessel from the surrounding scar lesion. Two of the arteriovenous aneurysms in the neck were resected. There was improvement of the neurological picture of the last four cranial nerves before and after operation. The vascular sac may have retarded recovery but this is not certain.

With regard to the vascular-nerve injuries of the upper extremities, one was a false aneurysm of the first part of the axillary artery, and another an arterial aneurysm of the lateral thoracic artery. Aneurysms of the brachial arteries, with the exception of one, were all resected by quadruple ligations and excision. In the lower extremities there was an arteriovenous aneurysm of the femoral artery and vein, and a popliteal arteriovenous aneurysm.

It is pointed out that it is never a matter of emergency to treat an aneurysm, for time must be allowed for the collateral circulation to develop, usually from three to four months. The treatment is to eradicate the arteriovenous aneurysm by quadruple ligation and excision. Partial measures lead to gangrene and failure. When major blood vessels are involved and the nutrition to extremities is in question, the endoaneurysmorrhaphy of Matas is preferred. When dealing with these combined lesions, it is impossible to attack both the vessels and the nerve in the same procedure.

ADRIEN VERBRUGGHEN, M.D.

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Evans, A. L.: The Treatment of Intracranial Infections with Penicillin. *J. Am. M. Ass.*, 1944, 124: 641.

Since the experimental work of Pilcher and others on intracranial infections, and especially since the introduction of penicillin, interest has been centered on the value of this substance in the treatment of intracranial infections.

In this report 3 cases are described in which it appears that penicillin was the most important factor in the satisfactory termination of the illnesses. The first case was one of complete skull fracture which developed pneumococcic (type 18) meningitis. It appears likely that the meningitis followed rhinorrhea. Penicillin was administered by the intravenous the intramuscular, and the intrathecal methods, and in this particular case, 5,000 units of penicillin were inserted directly into the cranial cavity in one stage. Altogether the patient received over 2,000,000 units of penicillin.

The second case was a case of abscess of the brain secondary to frontal sinusitis. Although the abscess was drained, it was found necessary to give the patient penicillin, which, the author presumes, led to a satisfactory recovery. This patient received altogether about 1,800,000 units.

The third patient developed a staphylococcal meningitis presumably after operation for extradural hemangioma in the neck region and here again large doses of penicillin were given and led to ultimate recovery.

From a perusal of the histories it would appear that perhaps the infections might have been avoided, but the main point of the article is that once infection is established, the intrathecal administration of penicillin may be of great value.

ADRIEN VERBRUGGHEN, M.D.

Adelstein, L. J., and Anderson, F. M.: Tumor of the Acoustic Nerve Within the Petrous Bone: Operative Removal. *Arch. Neur. Psychiat.*, Chic., 1944, 51: 268.

A case of a large acoustic nerve tumor which arose completely within the petrous bone and did not present itself to view in the usual location is reported. The tumor eroded the bone extensively and was disclosed at operation as a bulging mass on the posterior surface of the petrous pyramid, completely covered by a thinned bony wall. The patient was a

girl aged fifteen who had noted the gradual development of tinnitus and deafness in the right ear for six years and right facial weakness for three years. There was no history of trauma to the head. Neurological examination revealed definite cerebellar signs, slight impairment of function of the trigeminal nerve, diminution of deep reflexes on the opposite side of the body, and increased cerebrospinal-fluid pressure.

The tumor was removed at operation and subsequent histological examination of the specimen showed it to be a neurofibroma. Three months after removal of the tumor a spinal accessory-facial nerve anastomosis was performed on the right side, the descendens hypoglossi nerve being sutured to the distal end of the accessory nerve. The patient regained considerable motion and a good functional result in spite of the fact that the facial paralysis had been complete for two years.

It is probable that the majority of acoustic nerve tumors arise from the portion of the nerve within the petrous bone or in close approximation to the internal acoustic meatus. Growth usually takes place in the direction of least resistance (medially), so that the tumor presents itself at the cerebellopontine angle. In this case the tumor grew within the internal auditory canal to such size that it produced cerebellar signs and increased the intracranial pressure. Neoplasms of the eighth nerve confined entirely to the bony canal, reported hitherto, have been small tumors which produced no important clinical symptoms and were discovered postmortem on section of the petrous bone. JOHN L. LINDQUIST, M.D.

SPINAL CORD AND ITS COVERINGS

Lassek, A. M.: The Human Pyramidal Tract. Effect of Paralysis Produced by Cerebral Tumors on Axons of the Pyramids. *Arch. Neur. Psychiat.*, Chic., 1944, 51: 213.

This work is based on the study of the pathological material and clinical records of 119 cases of brain tumor, which had shown motor weakness and pyramidal-tract signs (especially the Babinski sign). All these cases presented some form of motor involvement, varying from heaviness of the extremities to complete paralysis. Of the 119 cases, 100 gave a positive Babinski, while 4 gave a positive Hoffmann, and 2 gave a positive Chaddock sign. In the reports of the other 13 no mention was made of the presence of any pathological reflexes. It is interesting to note that in only 62 cases were the abdominal reflexes absent on the affected side.

The author found evidence of destruction of the pyramidal tract in only 14.3 per cent of the 119 cases studied. Of these, 7.6 per cent showed a partial involvement of the pyramidal tract, while in 6.7 per cent complete destruction was observed. The clinical diagnoses in the cases with complete destruction of the pyramidal tract were as follows: weakness, 1 case; complete hemiplegia, 3 cases; hemiparesis, 1 case; paralysis, 2 cases; and contracture with paralysis, 1 case. The cerebral lesions were widespread. More than one lobe was always involved, including the frontal lobe and usually the subcortical elements.

In the cases which showed partial destruction of the pyramidal tract, there was also either partial or complete hemiplegia. In none of the cases with partial damage to the pyramidal tract were isolated or restricted parts of the pyramids affected; degeneration was scattered and uniformly distributed.

In the rest of the cases (102) the author was unable to detect any loss of fibers, gliosis, or decrease in area in the pyramids, with the staining method that he used (a silver stain).

In 1915 von Monakow remarked that in man the destruction of a whole hemisphere seems necessary for destruction of all the fibers of the pyramidal tract. This finding has been well substantiated by a number of workers. The study shows that there is some evidence that paralysis and the sign of Babinski may occur in many cases with little or no destruction of the pyramidal axons. DAVID JOHN IMPASTATO, M.D.

MISCELLANEOUS

Denker, P. G.: The Postconcussion Syndrome; Prognosis and Evaluation of the Organic Factors. *N. York State J. M.*, 1944, 44: 379.

This author presents a follow-up study of 100 cases of cerebral concussion and arrives at helpful conclusions concerning this little understood, but commonly encountered, syndrome.

In the selection of his cases all of those with more severe brain injuries were excluded as were compensation cases. Every practitioner is familiar with the symptoms common in these patients. Residual headaches, dizziness, and nervous instability are the most prominent. Approximately one-third of all those studied had such manifestations, and in 15 per cent they were still present after three years. Prolonged duration of complaints seemed more prevalent in patients over forty years of age.

The author speculates as to the basis for these symptoms, the most interesting theory being that popularized by Denny-Brown and Russell. These authors suggest that the entire picture is secondary to injury of the vasomotor center. It is significant that loss of consciousness was not present in 2 per cent of the cases and the severity of symptoms in these was no less than in those in which unconsciousness had resulted. Experimental work by various observers would seem to indicate that the crucial point in the prognosis in the postconcussion syndrome is the acceleration of the brain at the time of the injury.

The author hopes that as improvements are made in electroencephalography and in other diagnostic techniques, it might be possible to evaluate the brain alterations more closely in these conditions.

ADRIEN VERBRUGGHEN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Clagett, O. T., Plimpton, N. C., and Root, G. T.: Lesions of the Breast. *Surgery*, 1944, 15: 413.

An attempt was made to trace 442 cases of benign lesions of the breast from five to six years after surgical treatment at the clinic; 86.4 per cent of them were traced.

Carcinoma of the breast subsequently developed in 7, a crude rate of 1.8 per cent in the five-to-six-year period.

Carcinoma was not reported in any case of fibroadenoma or comedomastitis, but it did develop in the groups of patients who had had chronic cystic mastitis (3.3 per cent) and chronic mastitis (1.6 per cent).

The incidence of carcinoma of the breast in the entire series was five times as great as was the incidence of carcinoma of the breast in the population of women from twenty-five to sixty-five years of age in Minnesota for the year 1940. Such findings emphasize the importance of following closely patients with cystic disease of the breast in order to observe any recurrence of a benign condition or the possible development of a malignant process.

Etter, L. E.: Osseous Abnormalities of the Thoracic Cage Seen in 40,000 Consecutive Chest Photoroentgenograms. *Am. J. Roentg.*, 1944, 51: 359.

Although there is a paucity of information in the literature concerning anomalies of the thoracic cage, they are frequently seen by roentgenologists. This may be due to the fact that thoracic-cage anomalies are accepted as part of the roentgenologists' daily routine.

The author bases his report on the routine chest examinations of 40,000 inductees. Cervical ribs were present in 600. In only 1 of the 600 cases were the cervical ribs jointed. None of the individuals with cervical ribs presented any complaints referable to them at the time of examination.

Bilateral pseudarthrosis of the first ribs was present in 1 case. Sometimes this is mistaken for a fracture with callous formation or a calcified tuberculous process in the apex of the lung. There were 79 cases with rudimentary ribs, of which 67 were confined to the first ribs. A rudimentary first rib may be mistaken for a cervical rib from time to time. Synostosis of the ribs was present in 104 cases. This condition, too, was most frequent in the first and second ribs; it occurred in 77 cases. The right side was involved more often than the left. Bifid ribs were more frequently observed on the right side; bilateral involvement was rare. This occurred in 7 cases of the present series. Postural scoliosis was observed in 1 of every 300 men, healed rib fractures in 1 of every 800, and resected ribs for empyema in 1 of every 1,100.

The author directs attention to these rather common roentgenological anomalies of the thoracic cage inasmuch as they are far too often mistaken for pathological processes. MAURICE D. SACHS, M.D.

TRACHEA, LUNGS, AND PLEURA

Holinger, P. H., and Rigby, R. G.: Fusospirochetal Tracheobronchitis. *Illinois M. J.*, 1944, 85: 141.

Pulmonary suppuration is frequently complicated by a fusospirochetal infection. Infections due to these organisms are usually associated with copious, foul expectoration, lung destruction, abscess formation, or extensive bronchiectasis. The authors believe that the disease may also be in the nature of a chronic tracheobronchitis. The cases of 69 patients have been studied, in all of which organisms of the fusospirochetal group appeared to be the etiological agent. Practically all of the patients were adults.

The clinical features of fusospirochetal tracheobronchitis simulate pulmonary tuberculosis. Symptoms in these patients had been present for periods of from three months to twelve years, and consisted mainly of cough, loss of weight, low-grade fever, fatigue, occasional hemoptysis, and night sweats. Physical findings were few and not distinctive.

The bronchoscopic findings consisted simply of chronic bronchitis. The mucosa was injected and a small amount of mucopurulent secretion was present. The diagnosis was established on the basis of history, physical and bronchoscopic findings, and bacteriological studies of the secretions.

Usually, fusospirochetal organisms are saprophytes. When found in association with pyogenic organisms they may become pathogenic. The usual pyogen found was the streptococcus viridans.

The principal therapeutic agents are the arsenicals. Neoarsphenamine, sodium cacodylate, and mapharsen are specific when given promptly in moderate doses. Intravenous antimony and potassium tartrate are used in resistant cases. Large doses of vitamin C and a high calcium diet are advised, since experimentally the fusospirochetal organisms are more prominent in animals deficient in vitamin-C. Autogenous vaccines are employed, particularly in long-standing cases which have not responded well to arsenicals. The most frequent organism used in preparing vaccines is the streptococcus viridans. Postural drainage is used in patients who have a productive cough, and bronchoscopic aspiration is employed to relieve bronchial obstruction.

THOMAS F. THORNTON, JR., M.D.

McGrath, E. J.: A Revised Technique for the Treatment of Empyema. *South. M. J.*, 1944, 37: 127.

Experience in the treatment of acute empyema at the University Hospitals in Cincinnati led to dis-

satisfaction with the usual methods of surgical therapy, viz., simple aspiration, aspiration followed by open thoracotomy, and the older methods of closed drainage. The author has devised an alternate method of closed drainage to meet the following requirements:

The technique and after-care must be simple. Drainage must be adequate and continuous. The procedure should be well tolerated by very ill patients and allow considerable movement during convalescence. There should be no protrusion of tubes into the empyema cavity, but an airtight system must be maintained continuously.

Following diagnostic thoracentesis and the usual surgical preparation, the site of thoracotomy is infiltrated with 1 per cent procaine. A No. 30 to 36 French de Pezzar catheter is prepared by cutting off a one-inch length from the flared end, and the catheter is drawn over a stylet. A small skin incision is made and a large straight trocar is forced into the pleural cavity. The obdurator is withdrawn, and the operator's thumb placed over the open end of the trocar. The catheter, lubricated with mineral oil, is passed through the trocar into the empyema pocket. The expanded head of the catheter is drawn against the chest wall. The trocar is then withdrawn. A rubber sponge square is threaded over the catheter and drawn snugly against the chest wall. The previously detached flaring end of the catheter is also threaded over the catheter and drawn against the sponge rubber. The catheter is then secured to the chest wall with tape. The sponge and the collar on the chest wall act against the expanded end within the pleural space to produce an airtight, stable system.

The de Pezzar catheter is attached to a Wangensteen suction apparatus and decompressed at the rate of 100 cc. an hour in the average adult. When less than 100 cc. is obtained at aspiration, continuous drainage is maintained for forty-eight hours. Irrigations are then instituted with physiological saline solution, which is replaced in from two to three days by Dakin's solution. Once each day the cavity is filled with the irrigating fluid, and at four-hour intervals slightly less than this amount is introduced. Between irrigations continuous suction is maintained. In the past four years this method has been used in 147 patients to the entire satisfaction of the author. Four difficult cases, illustrating the practical application of the method, are presented.

THOMAS F. THORNTON, JR., M.D.

Janes, R. M.: Multiple Cavernous Hemangiomas of the Lungs Successfully Treated by Local Resection of the Tumors. *Brit. J. Surg.*, 1944, 31: 270.

Hemangioma of the lung is a comparatively rare disease. This report deals with the first case in which local resection of the individual tumors has been done. The diagnosis is dependent upon familiarity with the clinical picture. The condition can be treated successfully by local resection of the individual tumors if none of the lesions are too large. Operation is indicated because of the danger of fatal hemorrhage.

The case reported is that of a male aged thirty years. One year before admission he had two episodes of hemoptysis. Radiographs of the chest were said to be negative. One month before entry there were three more episodes of hemoptysis. There were no other symptoms of note.

Examination disclosed a thin pale man with definite cyanosis of the lips and finger nails. There were multiple small hemangiomas on the lower lip. A soft blowing murmur was found in the region of the right cardiophrenic angle. The white blood count was not remarkable, but there was some hypochromia of the red cells. Radiographs of the chest showed two shadows in the right lung, and one, or possibly two, in the left. Bronchoscopy was negative.

It was believed that either multiple hemangiomas or adenomas were present, so the right chest was explored on October 4, 1941. One hemangioma, about the size of a hen's egg, was found on the posterior margin of the lower lobe, and another, half that size, was present on the margin of the middle lobe. Both were removed and prompt recovery ensued. On June 25, 1942 two hemangiomas were removed from the left lower lobe. The larger was 1 in. in diameter, and the smaller 1 cm. in diameter. Sections of all tumors showed well defined blood vessels with dilatations forming cavernous spaces filled with blood. The lesions may be removed over clamps or sutures, or the vascular supply may be dissected out and occluded, and then the resection done.

The patient was working and had no cyanosis when last seen. THOMAS F. THORNTON, M.D.

Holman, E., and Pierson, P.: Multiple Echinococcus Cysts of Lung, Liver, and Abdomen. *J. Am. M. Ass.*, 1944, 124: 955.

The authors note that the diagnosis of hydatid disease in America, particularly in the western sheep-raising states, no longer provokes surprise as a medical rarity. It may be confidently predicted that its occurrence here will become more frequent and that in certain localities its presence must be suspected whenever unusual manifestations of hepatic or pulmonary disorders cannot be explained on other seemingly more rational bases.

The disease is most commonly found in areas where sheep pasturage prevails and where dogs are in intimate association with sheep and human beings. The cysts found in man, sheep, ox, or hog represent the larval stage of the tapeworm taenia echinococcus, which is harbored in the adult form in the intestine of dogs and related species. The egg liberated in the dog's intestine and transferred from dog to man, sheep, or hog, through intimate contact reaches the stomach and the small intestine, where the alkaline juices digest the egg membrane, and liberate the embryo, which penetrates the wall of the intestine and reaches the liver and other organs

by blood-stream migration. In its new location the embryo is soon surrounded by a limiting membrane produced by foreign-body reaction, within which a germinal layer is developed which is capable of producing innumerable brood capsules and daughter cysts. The life cycle of the tapeworm is completed when a dog or a member of a related species eats the infected entrails or carcass of a sheep or hog and the larvae reach the intestine of the dog, where they mature into the adult tapeworm.

Care must be exercised in the diagnosis of this condition in man. One must not be too easily led into a facile though false diagnosis on the basis of a positive complement fixation or a positive reaction to the intradermal test for both of these have been found to be fallible. In the human being those organs in which it is usually found may be extensively involved without subjective or objective evidence of its presence.

The authors present 3 cases in detail because of their unusual and instructive clinical features, and for the problems presented in surgical removal of the cysts. In conclusion, the authors note that multiple echinococcus cysts may occur in the lung, in the abdomen, and in the liver, almost without symptoms. Positive reactions following the intradermal injection of the echinococcus antigen cannot be relied on as clinching evidence in the diagnosis of echinococcus disease. Eosinophilia is not an invariable accompaniment.

In cases in which the cyst is in close relationship to the upper surface of the diaphragm, a large enough pneumoperitoneum should be given to explore the under surface clearly, since hepatic cysts may penetrate the diaphragm. Cysts in the abdomen may be completely excised, particularly when surrounded by omentum or when appearing on the surface of other organs. The investing fibrous tissue, which is often partly calcified, permits excision without fear of entering the cyst. When calcification has occurred in the liver or lung, it is necessary only to suck out the chitinous or germinal layer of the cyst, and leave behind the calcified wall.

The removal of thin-walled cysts of the lung by suction may be complicated by a pneumothorax, resulting presumably from small rents in the lung, unless provision for the escape of air is made at the operation by the introduction of a small catheter into the bed of the cyst connected externally with an underwater seal. This may usually be removed within from forty-eight to seventy-two hours.

The problem of removal of the dangerous elements of a cyst may be met as follows:

Withdrawal of from 30 to 50 cc. of the cyst fluid with an aspirating syringe and reinjection of from 10 to 20 cc. of a 10 per cent solution of formaldehyde. After several minutes a small incision is made in the cyst, and its contents are withdrawn with a large sucker. The contents include hooklets, daughter cysts, and the germinal layer, which strips easily and is effectively removed with the sucker. The walls of the remaining cavity are wiped with gauze moistened with a 10 per cent solution of formaldehyde and the cavity is washed out with saline solution.

Drainage or packing of the cyst cavity is not necessary and is definitely contraindicated to avoid secondary infection of a potentially incollapsible cavity. Except in the presence of pus due to a secondary infection, which obviously must be drained, the cyst cavity may be filled with salt solution and the incision of approach may be completely closed without drainage. Multiple cysts of the lung involving both sides of the thorax are most safely removed by two-stage procedures.

HERBERT F. THURSTON, M.D.

Brown, R. K., and Robbins, L. L.: The Diagnosis and Treatment of Bronchiogenic Cysts of the Mediastinum and Lung. *J. Thorac. Surg.*, 1944, 13: 84.

Twenty-one cases of bronchiogenic cyst of the mediastinum and lung are presented.

The diagnosis of these cysts is made roentgenologically. Characteristically, they present smooth contoured, round or ovoid, masses without surrounding inflammatory shadows. The present state of roentgenography does not permit, in all instances, differentiation between benign and malignant lesions of the chest and mediastinum.

Treatment is surgical. It consists of operative removal, which, with the present improved techniques of anesthesia and of surgery, is feasible and safe. Resection should be carried out as soon as the cyst is recognized even though it is clinically asymptomatic. Delay until the appearance of symptoms increases the operative risk because symptoms usually indicate infection within the cyst. Delay is also dangerous because preoperative differentiation between benign and malignant lesions is impossible.

CHARLES BARON, M.D.

HEART AND PERICARDIUM

Ayerza, L., and Cernich, R.: Primary Malignant Granuloma of the Pericardium (Granuloma maligno primitivo del pericardio). *Rev. As. med. argent.*, 1943, 57: 981.

The authors describe in detail the case history, clinical course, x-ray and histopathological findings of a patient having a primary hemorrhagic lymphogranulomatous pericarditis.

The patient, a thirty-eight-year-old male Argentinian, on admission to the hospital service, disclosed a marked cardiac insufficiency associated with cyanosis, dyspnea, ascites, and edema.

Physical examination and x-ray studies revealed a mediastinal pleuropulmonary mass associated with pleurisy and pericardial fluid. Paracentesis of the pericardium showed on laboratory examination hematocytoblastic cells of the Sternberg type in the drawn serofibrinous fluid.

Biopsy of the axillary and inguinal glands which had enlarged one week after hospitalization suggested Hodgkin's disease.

Roentgen therapy given in two series over the involved parts affected the final outcome little, the patient expiring with signs of cardiac insufficiency and anasarca three months after admission to the hospital. Investigation at autopsy disclosed a hemorrhagic lymphogranulomatous pericarditis, lymphogranuloma of the mesenteric glands and kidneys, and cirrhosis of the spleen, whereas histopathological studies revealed a lymphogranulomatous pericarditis (Sternberg), a Hodgkin-Sternberg-Paltauf lymphogranulomatosis of the mesenteric glands, and sclerosis of the spleen.

The outstanding feature of the case was the fact that the pericardium appeared to be the site of the primary tumor with secondary metastases to the glands. The finding of 84 per cent of eosinophils in the serofibrinous pericardial fluid and the renal involvement added to the unusual aspect.

STEPHEN A. ZIEMAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Singleton, A. O., and Knight, M. D.: Congenital Atresia of the Esophagus with Tracheoesophageal Fistulas. *Ann. Surg.*, 1944, 119: 556.

Congenital esophageal atresia has been recognized since 1696, but the anomaly is not common, and until recently there has been no treatment that offers any hope of success. There are three types of anomalies that may occur according to Vogt's classification. The first is complete absence of the esophagus and is quite rare. The second includes cases which show a blind upper and blind lower segment, neither of which communicates with the trachea. The third group represents cases with a fistulous communication with the trachea. In type 3A the upper segment opens into the trachea; in type 3B the lower segment of the esophagus opens into the trachea; in type 3C both segments communicate with the trachea. Type 3B is the most common, and all may be associated with other congenital anomalies.

The symptoms are constant and diagnostic. The infant drools excessive amounts of mucus and saliva. He is subject to frequent attacks of choking and cyanosis, and these are precipitated by the taking of fluids by mouth. Fluids are immediately regurgitated and aspirated.

A soft rubber catheter inserted into the esophagus will usually establish the diagnosis. Contrast media should be used cautiously and aspirated at once to prevent seepage into the lung. In the common type 3B and in type 3C the bowel will be distended with gas.

If untreated, these infants lose weight rapidly and usually die within a week. Surgical treatment has been unsuccessful either because of failure to prevent backflow of the secretions from the stomach into the lungs, or because of overflow from the blind upper esophageal segment into the lungs.

More recent operations to overcome these hazards have the disadvantage that they require an antethoracic cutaneous esophagoplasty. Haight and Townsend have successfully closed the tracheoesophageal fistula, performing a primary esophageal anastomosis extrapleurally. Others have adopted this method with modifications.

The authors believe that transpleural ligation is more rapidly performed and that the anastomosis is more simply carried out by this method. The operative technique in 2 such cases is presented. One patient lived seven months and undoubtedly would have survived indefinitely had not a small fistulous communication between the upper esophageal segment and the trachea been overlooked. This fistula resulted in a fatal aspiration pneumonia.

THOMAS F. THORNTON, M.D.

Bersack, S. R.: Carcinoma of the Esophagus in Association with Achalasia of the Cardia. *Radiology*, 1944, 42: 220.

Between 1931 and 1942, inclusive, 227 patients with carcinoma of the esophagus were admitted to the Edward Hines Hospital, Hines, Illinois. In only 1 of these cases was achalasia associated with the

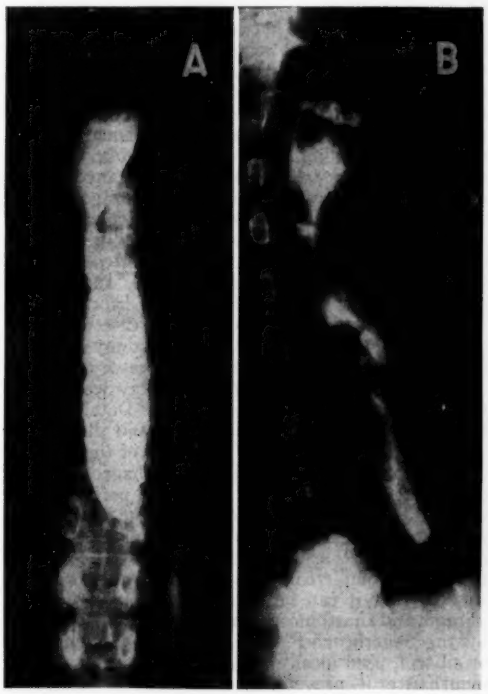


Fig. 1. Carcinoma of the esophagus in association with achalasia. Note the smooth narrowing at the supradiaphragmatic level and the extensive irregular filling defect of the midportion of the esophagus. (*a*) Posteroanterior view. (*b*) Right oblique view.

carcinoma. The patient, forty-seven years of age, had had vomiting after the ingestion of food for ten years. Roentgen examination disclosed an advanced carcinoma of the midportion of the esophagus and achalasia of the cardia. Esophagoscopy disclosed a ragged ulcerating and bleeding mass 26 cm. from the teeth. The histological diagnosis was squamous-cell, undifferentiated carcinoma of grade 3.

Although shallow ulcerations, nests of epithelial hyperplasia, and wartlike formations have repeatedly been reported in achalasia, malignancy has apparently occurred relatively infrequently. However, the authors call attention to the fact that careful and repeated esophagoscopies are necessary for the early detection of carcinoma in patients suffering from achalasia. HAROLD C. OCHSNER, M.D.

Allende, J. M., De Goycoechea, O. L., and Lánger, L.: Resection of the Esophagus for Cancer (Reseccion del esófago por cáncer). *Bol. Soc. cir.*, 1943, 4: 277.

Thirty-four patients with cancer of the esophagus, confirmed by biopsy, were admitted to the National Clinical Hospital from August 1941 to August 1943. Of these patients 25 were males and 9 females. Seventy per cent were between forty and sixty years of age, those over fifty being twice as many as those under fifty. The remaining 30 per cent were more than sixty years of age. The symptom which brought most of them to the physician was more or less complete dysphagia. Early diagnosis of cancer of the esophagus will be impossible until the public and general practitioners are taught the importance of the slightest sign of dysphagia in the cancer age.

The possibility of resection of the esophagus was considered in 32 of these cases. But peritoneal glandular metastases, demonstrated by rectal palpation, showed that 20 of them were inoperable. In all but 1 of the remaining 12, laparotomy was performed in a search for peritoneal metastases. In case of doubt the Beck-Jianú gastrostomy or jejunostomy was performed. In 6 of the 12 cases exploratory thoracotomy was performed. Esophagectomy was found to be indicated in only 4 of the cases. Detailed case histories of these 4 cases are given and illustrated with roentgenograms. The technique of the preliminary gastrostomy and the Torek esophagectomy are described. Esophagectomy cannot be performed in tumors above the arch of the aorta. The Beck-Jianú gastrostomy is indicated in cancers of the middle half, and Witzel's jejunostomy in low cancers. In these cases complete mobility of the stomach is necessary so that it can be herniated through the diaphragm and anastomosed directly with the esophagus by the Sauerbruch-Fischer operation. Sulfadiazine or cibazol, used locally during the operation and by mouth after it, prevents or attenuates infection.

The Torek operation was performed in 3 of these 4 cases and the Sauerbruch-Fischer operation in the remaining case. Three of the patients died; the fourth was alive and in good condition eight months after the operation. AUDREY G. MORGAN, M.D.

MISCELLANEOUS

Kent, E. M., Valle, A. R., and Graham, E. A.: Intrathoracic Neurogenic Tumors. *J. Thorac. Surg.*, 1944, 13: 116.

All intrathoracic tumors have assumed a more important role in medicine within recent years because of the improvements in diagnosis and the development of thoracic surgery. Those tumors which arise in nerve elements are of special importance since there is a prevailing misconception that they are nearly always benign. The authors found in a series of 18 proved cases at the Barnes Hospital, St. Louis, Missouri, that in no less than 7 (41 per cent) the tumor was malignant as shown by gross and microscopic pathological findings, and in 1 case it was impossible to arrive at a definite decision concerning the malignancy of the tumor. This incidence of malignant tumors evidently agrees closely with that of others, for in a collected series of 105 cases from the literature, 39 cases (37 per cent) were considered malignant. It would seem that those tumors which arise either within or close to the posterior mediastinum are less frequently malignant than those which arise from the chest wall at some distance from the mediastinum.

The most common tumor of the posterior mediastinum or of the posterior part of the superior mediastinum is one of neurogenic origin. In the authors' series of 18 patients with proved tumors and 3 with presumptive ones (a total of 21 cases), 19 of the tumors were in the posterior part of the thorax and only 2 in the anterior mediastinum. In only 2 of the series of 101 cases collected from the literature was the tumor located in the anterior mediastinum. The next most common tumor of the posterior mediastinum is the much more rare one consisting of elements of bone or cartilage. From a practical diagnostic standpoint, in any case of recognized tumor of the posterior mediastinum the chances are that it is one of nerve origin.

The essential characteristics of the nerve tumors which are found within the thorax do not differ from those of peripheral nerve tumors encountered elsewhere in the body. There is still some uncertainty as to their origin and the many names which have been given to them have increased the confusion. It is generally agreed, however, that the most common tumors originate in the nerve sheath. However, some controversy has occurred regarding which elements of the sheath are the most important.

Geschickter recognizes two varieties of solitary benign nerve sheath tumors, a differentiated and an undifferentiated group. The tumors which belong to Geschickter's first group, especially those which fall into the category designated by Stout as neurilemmomas, constitute the principal type of nerve tumor encountered within the thorax and their frequent origin in this region is the intercostal nerves. Perhaps the next most common type is one characterized by the presence of multipolar ganglion cells. Grossly, such tumors do not differ essentially from

the neurilemmoma and the clinical picture of the patient and special studies do not provide differentiation between them. Those tumors revealing numerous widespread ganglion cells are designated ganglioneuromas. If they contain a preponderance of fibrous tissue they are sometimes called ganglioneurofibromas. They are usually considered to have arisen from the sympathetic nervous system. It has been our experience that certain nerve tumors which present the picture of the neurilemmoma may show, in additional sections from other areas, the presence of ganglion cells. Accurate classification, in our opinion, warrants the study of multiple zones from this group of tumors.

Some of the primary nerve tumors arise within the intervertebral foramina and they extend both to the spinal canal and outwardly into the posterior mediastinum. They are often called hourglass- or dumbbell-shaped tumors. The possibility of this configuration in all posterior mediastinal tumors which may be of nerve-tissue origin must receive careful consideration. Close co-operation between, and joint study by, both the thoracic surgeon and the neurosurgeon should be undertaken to determine the presence of tumor extension within the spinal canal.

The symptoms produced may be of no consequence or they may be more severe and of a sort resulting from involvement of certain nerves. In many instances the tumor has been discovered accidentally by an x-ray examination made for some other reason. In other cases the patients have complained of pain which has been radicular or referred along an intercostal nerve. Other symptoms sometimes presented are dyspnea, stridor, unproductive cough, hoarseness with paralysis of a vocal cord, and Horner's syndrome from involvement of the sympathetic chain.

These tumors present a rather definite roentgenological picture. They are usually single when encountered within the thorax, and since most of them are adjacent to or within the posterior superior mediastinum, they present a sharply circumscribed, nonpulsating, rounded mass in the posterior upper thorax. In some cases there is an associated erosion of the ribs lying adjacent to the mass. A lobulated appearance of the tumor is always suggestive of rapid growth and therefore of malignancy. Otherwise, however, there is no characteristic x-ray finding which justifies a diagnosis of malignancy unless metastases can be demonstrated. Even the demonstration of the presence of a pleural effusion does not justify an assumption of malignancy. Harrington had a case in which there was bloody fluid even before operation although the tumor was subsequently proved to be benign. A diagnostic test dose of radiation therapy is of little or no value in establishing a diagnosis of malignancy because the neurogenic tumors, even the malignant ones, are but little affected.

The only effective treatment for intrathoracic nerve tumors is surgical removal. Because of the high incidence of malignant change it is wise to remove these tumors as soon as the diagnosis is made unless there are other reasons for not advising an operation. The operative approach is planned according to the position of the tumor to be removed. Since the majority of the tumors are in the posterior mediastinum, a posterior approach is used most frequently. If the patient has an hourglass tumor it is preferable to remove both the intraspinal and intrathoracic parts at the same operation. If, however, such extensive surgery should be contraindicated at one stage, the intraspinal portion should be the point of attack.

CHARLES BARON, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Merke, F.: The Operative Risk in Nonincarcerated Hernias in Patients more than Sixty Years of Age (Das Operationsrisiko der freien Hernien jenseits des 60. Lebensjahres). *Schweiz. med. Wschr.*, 1943, 73: 458.

Many surgeons refrain from a herniorrhaphy in patients who have reached the sixth decade, while the majority operate on patients who have entered their seventh decade only if an incarceration or strangulation has occurred. The problem is becoming increasingly important because little by little more persons reach an old age. For instance, in Basel, Switzerland, the number of persons who reached the age of sixty was twice as large in 1940 as that in 1900. It follows that the number of older individuals with hernias is gradually increasing.

The author's material of 102 patients comprises inguinal, umbilical, femoral, and postoperative hernias. Although one patient was eighty-three years and another eighty-five years old, only 1 death could be attributed to the operation. A sixty-five-year-old woman had an enormous recurrent inguinal hernia with occasional signs of incarceration; however, at the time of the operation, which was performed under spinal anesthesia, the hernia was not incarcerated; gastrointestinal hemorrhages which occurred ten days after the operation caused the patient's death three days later. The author attributed the hemorrhages to a retrograde omental and mesenteric thrombosis.

Subjective complaints and recurrent signs of incarceration served as indication for operation. It must be remembered that the mortality of irreducible incarcerated hernias in older individuals is very high; in the author's material the figures reached 11.3 per cent in patients more than sixty years of age.

Grave circulatory, renal, or pulmonary lesions, and also obesity, are considered contraindications for an operation. The latter should be performed under local or spinal anesthesia. Especial attention should be paid to the preoperative care and the patient should leave his bed the day following the operation.

The author concludes that the risk of an operation for nonincarcerated hernia in older people is not particularly great, provided that there are no contraindications and the preoperative and postoperative treatment is given proper attention.

JOSEPH K. NARAT, M.D.

Patrick, W.: Recurrent Hernia. *Brit. J. Surg.*, 1944, 31: 231.

An investigation of a series of 70 cases of recurrent hernia, personally treated, was carried out to determine possible factors causing recurrence. All of the hernias were of the inguinal variety and the right side was the site of recurrence in twice as many cases as the left. More than half of the primary operations had been done in military hospitals. With 2 exceptions all of these operations had been done since the outbreak of the war. In the military cases, therefore, early recurrence was apparent. All of the patients were healthy, muscular individuals living under military-service conditions, which excludes the type of patient as a possible causative factor in this series.

The study of the nature of the recurrence concerned the repair of the canal and the treatment of the sac. It was possible to state that the primary repair of the canal had been performed in accordance with a definite procedure in only 11 cases. The Bassini operation was responsible for 10 recurrences, and 1 of these included at the same time a repair by a Gallie fascial graft. These figures for the Bassini operation are surprisingly low, about 14 per cent of the 70 cases. Of the Bassini recurrences, 4 were of the direct and 6 of the indirect type. In 5 of the latter 6 recurrences the primary sac had not been removed. The details of the original operation could not be determined in the remaining 59 cases, and it is assumed that no specific repair operation had been carried out. Indirect sacs were found in 52 cases and direct sacs in 18 cases. The types of sac and related causes of recurrence are shown in Table I.

An analysis of the age groups did not throw any light on the question of recurrence in this series. Most of the recurrences took place up to the ninth month, with greatest incidence in the period from the third to the sixth month, and during the second year after operation. These figures suggest that during the first nine postoperative months there may be some factors in recurrence which can be associated with the operative technique, the postoperative management of the case, or the duration of the period before the return to full duty. In this study a premature return to duty could not be considered a pronounced factor in the causes of recurrence. The recurrences during the second postoperative year are not so easily explained, although in some cases the primary operation had been at fault. Other features of these recurrences were that they were found on one side only following a bilateral operation in 6 cases and that they were found a second time in 5 cases.

The chief causes of recurrent hernia in this study were inadequate treatment of the sac, and faulty or ill-chosen repair of the canal. Other considerations are faulty postoperative management, careless handling of the tissues and dislocation of the cord, incomplete hemostasis and sepsis in the wound, and serious chest complications. There is also the type of recurrence for which no adequate explanation can be found at operation. The reason for this may be a

TABLE I.—TYPES OF SAC AND RELATED CAUSES OF RECURRENCE

A. Oblique Sacs

Classification	No. of cases
Sac not removed at previous operation	17
Sac tied only at neck	9
Sac incompletely removed	7
New sac arising from previous neck	3
Apparently new sac	16

B. Direct Sacs

Operation in infancy	3
Second recurrence	3
Bassini operation	4
New sac without obvious cause	8

weakness or a definite gap in the transversalis fascia at the internal ring resulting from the previous operation. It cannot be said that the use of unsuitable suture material is one of the chief causes of recurrence.

The author considers the Bassini operation as totally inadequate and the Gallie fascial graft as unnecessary in the primary repair of hernia. He recommends the method using a fascial-flap from the rectus sheath or the "slide" operation with accurate repair of the transversalis fascia at the internal ring and narrowing of the ring on its lateral aspect by suture. JOHN L. LINDQUIST, M.D.

Lucas, B. G. B.: Postoperative Respiratory Complications Following Unilateral Inguinal Herniorrhaphy in War Time. *Brit. J. Surg.*, 1944, 31: 288.

A study of 438 cases of unilateral inguinal herniorrhaphy in Service patients has been made from the point of view of postoperative respiratory complications. An anesthetic technique is described which has produced the best results. Most of the respiratory complications are atelectatic in origin. The main factor in their causation is the hypoventilation immediately following the operation. This is due primarily to the operation itself, not to the anesthesia, but general anesthesia, particularly with ether, tends to aggravate the condition. A history of upper respiratory infection within three weeks predisposes to respiratory complications. Such complications as occur are best treated by breathing exercises and carbon-dioxide therapy. The results of chemotherapy have been poor.

J. M. MORA, M.D.

Delrio, J. M. A., and Carpanelli, J. B.: Drainage and the Local Use of Sulfa Drugs in the Treatment of Acute Peritonitis (Drenaje y sulfamidas local en las peritonitis agudas). *Rev. As. méd. argent.*, 1944, 58: 55.

Arguments have been presented against the use of drainage in the treatment of acute peritonitis, but the authors believe from a study of the statistics and of their own work that drainage is indicated, although to a much smaller extent than was formerly the custom. Bland solutions should be used and they should be removed promptly for if they are left in the peritoneal cavity for any considerable time they may prove useless and even harmful. The local use of sulfa drugs had made it possible to reduce the amount of drainage, and in some cases of limited peritonitis has made it possible to dispense with it entirely.

The authors present a study of 52 cases of acute peritonitis, most of them resulting from appendicitis, and give case histories of 32. The higher mortality in the drained cases was due, not to the drainage, but to the fact that drainage was used only in the severest cases. The use of sulfa drugs shortens the postoperative course, renders it less painful, and prevents or decreases suppuration of the walls, which results in fewer cases of eventration. It probably does not decrease the mortality in severe cases, and efforts at prophylaxis and early treatment should therefore be continued.

The authors have never seen any bad results from the use of sulfa drugs, either by powdering of the peritoneum or by the introduction of a solution of the drug by means of puncture after suture of the wound. During the first twenty-four hours, sulfa drugs should not be used in any other form or method of administration.

Different surgeons recommend different forms of sulfamide. Epps, Ley, and Howard say that sulfanilamide, sulfapyridine, and sulfathiazole can be used without bad effects and that the last is the most effective. Mueller and Thompson prefer sulfadiazine to sulfathiazole.

The authors themselves use sulfanilamide, sulfathiazole, and sulfapyridine, sometimes associated with each other or with prontosil. The greatest concentration in the blood, from 14 to 15 mgm. per cent, is reached within the first two to four hours and then it decreases until it practically disappears within forty-eight hours. The authors use about 7 gm. of the drug associated with a solution of 1.50 gm. of prontosil, or a little more than 8 gm. in all, besides the 1 to 4 gm. applied to the walls.

AUDREY G. MORGAN, M.D.

GASTROINTESTINAL TRACT

Vance, C. A.: Congenital Pyloric Stenosis. *Ann. Surg.*, 1944, 119: 351.

Congenital pyloric stenosis is the most common condition that requires surgical treatment in the first few weeks of life. The baby with this condition has an increase in size of the pyloric muscle, so that the lumen is compressed and obstructed and there are signs of high intestinal obstruction.

The mortality in this condition varied from 50 to 75 per cent prior to 1908. Today, proper surgical technique combined with good preoperative and postoperative care has reduced the mortality in competent hands from 1 to 2 per cent.

The cause of congenital pyloric stenosis is not understood. Three factors seem to enter into its formation: (1) congenital hypertrophy of the pyloric muscle; (2) spasm, which may be secondary to the congenital

hypertrophy; and (3) an added compensatory or work hypertrophy. It affects male children predominantly, in a ratio of about 9 or 10 to 1. There seems to be a preference for first-born babies who are robust and above the average weight at birth. It would appear that the parents are most often young, healthy, and in favorable economic circumstances. Familial occurrence has been frequently mentioned in later reports.

The pathological findings are hypertrophy of the circular pyloric muscle and an actual increase in the number of smooth muscle fibers. This produces an olive-sized, bulbous or fusiform mass which has a smooth external surface. It seems almost as hard as cartilage. The lumen of the stomach is gradually reduced in size toward the pylorus, but the lumen of the duodenum assumes its full size at once because of the abrupt termination of the pyloric sphincter at its distal end.

The symptoms of all cases are those of high obstruction and severe loss of body fluids. Symptoms start suddenly with vomiting which becomes projectile and is followed by constipation, loss of weight, and exaggerated gastric peristalsis. However, the pathognomonic symptom which makes certain the diagnosis of congenital pyloric stenosis is the presence of a palpable tumor in the right upper quadrant, a little above the level of the umbilicus at the outer border of the right rectus muscle. Roentgenological examination is not always necessary. There are, however, a few cases in which the history is atypical, or the physical examination is unsatisfactory, and whenever the diagnosis is in doubt, it is best to obtain additional information by roentgenological examination.

Operative treatment for congenital pyloric stenosis is not an emergency procedure, and a baby destined to surgery should be prepared for operation by a good medical regimen.

Through a high rectus incision on the right side the pylorus is delivered into the wound and the tumor held between the thumb and index finger while a longitudinal incision is made over the tumor at its least vascular part until the mucosa is bulging. Then the back of the knife is used to complete the operation until the mucosa is bulging into the wound. Any bleeding can usually be controlled by moist pads. It is most important to see that all bleeding is stopped before the abdominal-wall incision is closed because death due to hemorrhage from the pyloric incision has been reported. The complication most to be dreaded is the accidental opening of the duodenum. The change from thick pyloric tumor to thin duodenum is abrupt, therefore great care must be exercised in separating the cut edges of the muscle toward the duodenal end.

After pyloromyotomy for congenital pyloric stenosis, gastric peristalsis is inhibited for several hours or longer. Water is given sparingly at first and if the child is not vomiting at the end of twelve hours a suitable formula or breast milk is started and given every three hours. At the end of two weeks generous feedings are tolerated, the baby is gaining weight normally, and the wound has healed.

STEPHEN A. ZIEMAN, M.D.

Casanueva, M., Velasco, A., and Calderon, E.: Tuberculosis of the Stomach; A Statistical Review of the Literature, with Presentation of a Case (Tuberculosis del estomago; revisión estadística y de literatura con presentación de un caso). *Rev. med. Chile*, 1943, 71: 1177.

Tuberculosis of the stomach is an organic lesion of bacterial origin characterized by a long chronic course. It is never recognized before operation and depends upon histopathological findings for a positive diagnosis. It is frequently confused with gastric ulcer and is of very rare occurrence, being found in less than one-half of 1 per cent of the cases analyzed.

Diagnosis depends upon inspection of the lesion and the histopathological findings, confirmed by the presence of Koch's bacillus. The lesion is either ulcerative, hypertrophic with primary fibrosis, or inflamed. The forms observed are ulcerative, single or multiple, miliary, solitary, nodular, tumoral, and those of tuberculosis lymphangitis. Pyloric stenosis produced by an adjacent tuberculous ulcer has been described. The usual site of the lesion is in the lesser curvature near the pylorus.

In the report of the case analyzed, it was found that the forty-year-old patient complained of indefinite digestive pains for two years which were relieved with alkalies. The pains, however, gradually became worse and more diffuse and forced him to seek medical aid.

Roentgen studies revealed a solitary ulcer which was not amenable to drugs. On operation a callous ulcer was found in the lesser curvature, firmly adherent to the pancreas. A gastrectomy high on the lesser curvature side was performed, and the histopathological diagnosis was tuberculous adenitis with chronic ulcerative tuberculosis of the stomach. Koch's bacilli were demonstrated in an area adjacent to the ulcer. STEPHEN A. ZIEMAN, M.D.

Estes, W. L., Jr., and Bennett, B. A., Jr.: Acute Perforation in Gastroduodenal Ulceration, with Special Reference to End-Results. *Ann. Surg.*, 1944, 119: 321.

Eighty cases of acute perforated gastroduodenal ulceration treated by operation are reported. In this group there were 7 postoperative deaths, an operative mortality of 8.7 per cent. Sixty-three of the ulcers were duodenal, 16 gastric, and 1 jejunal. Only 2 of the perforations occurred in women.

The clinical syndrome of perforation, as observed at the time of admission to the hospital, is described. In approximately 90 per cent of the cases, a dramatic onset with marked prostration was described. Shock was rarely present, but most of the patients were first examined at least two hours after perforation.

The severe agonizing pain, the scaphoid abdomen with a transverse depression across the epigastrium,

boardlike abdominal rigidity with extreme tenderness, especially in the epigastrium, and the full, not accelerated, pulse is a clinical syndrome not simulated by any other acute abdominal accident. In the atypical case diagnosis may be confirmed by roentgenological demonstration of pneumoperitoneum.

Simple closure of the perforation is the operation of choice and was performed in 61 cases. The technique described utilizes an upper right-rectus incision and spinal anesthesia. A purse-string suture of chromic catgut is placed around the perforation at a distance of at least 1 to 1.5 cm. from it. After this is tied, it is re-enforced by burying it beneath two layers of chromic catgut placed transversely to the long axis of the intestine. Sulfanilamide may be dusted over the suture line and in the subhepatic space. Finally, whenever possible, the tip of the greater omentum is placed over the operative site. Drainage is used only in the late cases or cases in which closure is unsatisfactory and further leakage possible.

Fifteen patients were treated by excision and closure or pyloroplasty, and 4 patients by simple closure and gastroenterostomy.

The low postoperative mortality rate is attributed to (a) early operation; (b) spinal anesthesia; (c) immediate (preoperative) routine use of intravenous plasma, glucose, or saline solution; and (d) postoperative gastric suction and the sulfonamides.

Fifty-three cases have had adequate follow-up records for review. Of these, only 5.6 per cent were completely cured; 71.7 per cent required medical treatment for control; and 22.8 per cent required further hospitalization or surgery. Four of the 50 cases of simple closure which were followed up required secondary gastroenterostomy or resection.

Reperforation occurred in 8 of 63 cases. Six of these were duodenal and 2 gastric. One patient with a duodenal ulcer had reperforations twice, after simple closure in each instance. The common contributing factors encountered in a review of these cases are: dietary indiscretions, overindulgence in alcohol and tobacco, and marked gastric hyperacidity.

It is suggested that patients who recover from perforated ulcers and who persist in exhibiting excessive hyperacidity which is difficult to control by medical measures be subjected to partial gastrectomy. EDWARD W. GIBBS, M.D.

Lahey, F. H., and Marshall, S. F.: Indications for, and Experiences with, Total Gastrectomy. *Ann. Surg.*, 1944, 119: 300.

A definite diminution in operative mortality of total gastrectomy is reported from the Lahey Clinic, Boston, Massachusetts. Although the mortality rate reported in 73 cases was 33 per cent, 28 patients have been operated upon in the last two years with only 5 deaths, a mortality of 18 per cent.

All patients with gastric carcinoma, even though the lesion produces rigidity of the entire stomach, should be explored, if the lesion is not accompanied by obstruction, Virchow's nodes, a rectal shelf, fixation, palpable metastatic liver nodules, or roentgenological evidence of involvement of other areas.

The linitis-plastica type of stomach carcinoma, frequently not associated with visible lymph-node involvement, is often a good subject for total gastrectomy. Lymphosarcoma with its tendency toward mural infiltration also falls in this group. A third type of malignancy which is eligible for total gastrectomy is the sarcomatous degeneration of multiple leiomyomas, and carcinoma of the cardiac end of the stomach represents a fourth group suitable for total gastrectomy.

The authors prefer the transabdominal resection to the transpleural method, provided enough normal esophagus exists. Transpleural resection is reserved largely for lesions arising within the esophagus.

Preoperative preparation includes correction of anemia, restoration of water and mineral balance, blood transfusions, and the administration of glucose and vitamin C. Thorough preoperative lavage of the stomach with dilute hydrochloric acid mechanically cleanses the stomach and diminishes the bacterial flora of the gastric contents.

Fractional spinal anesthesia is used in all gastric resections.

The final decision of whether or not total gastrectomy should be undertaken must be made with the abdomen open. If metastases are present which cannot be removed, gastrectomy with its high mortality rate is not justifiable.

Technical considerations in the operative procedure are well defined and clearly illustrated. Postoperative feeding and management are discussed.

Peritonitis was the cause of death in 14 of the 24 patients who failed to survive operation. Other causes of death were shock, coronary occlusion, myocardial failure, pulmonary embolism, bronchopneumonia, and mediastinitis.

Prolongation of life may be expected in a large percentage of patients, but few, if any, cures will result from total gastrectomy except possibly in patients with leiomyosarcoma.

Of 48 patients who survived total gastrectomy, 15 lived for a year or longer before recurrence caused their deaths. Twelve patients are alive and well, having survived a year or longer. Seven patients have lived two or more years. One patient has survived four and a half years and another six years.

EDWARD W. GIBBS, M.D.

Fortes, J. F.: Intestinal Intussusception (Invaginaçao intestinal na criança). *Rev. med. mun.*, 1943, 5: 359.

The author furnishes roentgenological data pertaining to 6 cases of intestinal intussusception in infants. He emphasizes the desirability of a uniform classification of the condition. The knowledge of an incomplete intussusception is essential. The recognition of an incomplete invagination is very difficult.

The author highly recommends the use of a simple enema for the detection of blood. Contrary to the

popular recommendation, he does not advocate roentgenoscopy for this purpose.

He believes that recovery is due to an antiperistaltic action; the changes in the intestinal motility are attributable to the irritation of the muscle fibers by the attempts at reduction. Some disinvaginations which are considered spontaneous are caused by reduction maneuvers in x-ray laboratories.

Even if several attempts at reduction have failed, an additional trial should be made immediately preceding operation. JOSEPH K. NARAT, M.D.

Ficarra, B. J.: Traumatic Perforations of the Small Intestine Due to Nonpenetrating Abdominal Injuries. *Surgery*, 1944, 15: 465.

Perforation of the small intestine is a potential injury following any nonpenetrating wound of the abdomen. The areas most frequently involved are the duodenum, the area near the ligament of Treitz, and the ileocecal region. Eighteen cases are reviewed.

In making the diagnosis of intestinal perforation, the history of the patient is of utmost importance. Patients with this type of injury usually complain of abdominal pain. There may be a latent period of freedom from symptoms following trauma. The pain may be intermittent or continuous, and frequently it is associated with vomiting or hematemesis. The latter is particularly common with duodenal injuries. The physical findings usually are those of an acute surgical condition of the abdomen. The demonstration of free gas in the peritoneal cavity on x-ray examination is certain evidence of perforation, but oftentimes it is not demonstrated. A progressively rising pulse rate and a change from local to generalized abdominal tenderness with rigidity are indications for surgical intervention. If the diagnosis is in doubt, and there is one sign or symptom pointing to the possibility of a perforated viscus, and the patient is a satisfactory operative risk, surgery should be undertaken.

Preoperative treatment for shock and dehydration is of paramount importance. In most of the cases reviewed, general anesthesia was used. A right-rectus incision was preferred. The amount of peritoneal fluid suggested the location of the injury. If little or no peritoneal fluid was found, examination of the small intestine was begun at the duodenum. If a large amount of fluid was present, examination commenced at the ileocecal junction. Most lacerations have a tendency to run parallel to the transverse axis of the bowel and usually occur on the antimesenteric border.

The mortality for injuries of this type is high, and is due in part to multiple injuries. Ten of the 18 patients whose cases are reviewed, died.

Successful reduction of the mortality rate depends upon:

1. Immediate recognition of an intra-abdominal perforation.
2. A decision that operation is necessary, provided the patient is a satisfactory operative risk.
3. The least possible delay in operation and rapid surgical repair of the injuries.

EDWARD W. GIBBS, M.D.

Collins, J. D.: Neurofibroma of the Small Intestine. *Ann. Surg.*, 1944, 119: 362.

Benign neoplasms of any kind are uncommon in the small intestine. It is difficult from the early reports to decide which of the fibromas reported were of neurogenic origin. Intestinal neurofibromatosis was recognized and described some years before the beginning of the present century.

Visceral neurofibromas may occur as a solitary growth or they may appear as multiple tumors and may be found anywhere in the intestinal tract from the lips to the anus. Although they may undergo malignant degeneration, they are, no doubt, primarily benign, and therefore should be treated accordingly.

There is no uniformity in the clinical details furnished by those who have reported these cases of intestinal neurofibromas. The growths had in all probability existed for a long time without producing any symptoms whatsoever. The youngest patient was twenty-nine and the oldest seventy-three; there were 7 males and 11 females. Some of the patients gave a history of gastrointestinal disturbances which may well have been due to the presence of the tumor, but none of these manifestations could be considered pathognomonic. Abdominal pain and palpable tumor were the most frequent complaint. The pathological diagnosis is based upon the palisade structure of the cell nuclei, the oval shape of the cells, and the scarcity of collagen fibers.

Because of the ease with which benign growths may be surgically treated, in contrast to the difficulties and dangers inherent in handling any type of malignant neoplasia, the importance of differentiation between benign and malignant growths of similar structure is emphasized.

STEPHEN A. ZIEMAN, M.D.

Prioleau, W. H.: Massive Resection of the Small Intestine. *Ann. Surg.*, 1944, 119: 372.

Massive resection of the small intestine is the term applied to those cases in which 200 cm., or more, of small intestine have been resected. This is generally estimated at one-third the total length, although there must be considerable variation in individuals, and in children it is relatively a greater proportion of the whole.

While there appear to be a number of exceptions, the nutritional status is definitely affected by the relative amount of bowel removed. Discounting the operative risk and postoperative complications, one may expect a patient to regain a normal nutritional status following the removal of 33 per cent of the small intestine. Fifty per cent is given as the upper limit which may be borne with a possibly satisfactory outcome. A loss greater than this is almost invariably followed by serious nutritional disturbances of varying degree.

Inadequate compensatory changes following massive resection of the small intestine result in loss of weight, anemia, and diarrhea, also, at times, edema. There is excessive loss of fat and protein in the stools, and the blood calcium and serum proteins are low.

Prioleau reports 2 cases of massive resection of the small intestine, one in which the patient survived the resection of 260 cm. of small intestine and 31 cm. of sigmoid colon, and two subsequent major operations for re-establishing the continuity of the large intestine; and one in which the patient survived the resection of 354 cm. of small intestine and 40 cm. of sigmoid colon, but pursued a generally downhill course, and died four months later of nutritional disturbances and postoperative complications.

The first case is of interest from the standpoint that the patient regained good health following the resection of approximately 40 per cent of the small intestine and a section of sigmoid colon, and the two subsequent major operations. No hernia resulted, although three longitudinal incisions were made in a contaminated field. This is attributed partly to the use of alloy steel wire. The telescoping anastomosis of the rectosigmoid resulted in stricture formation, which was dilated only with difficulty but showed no tendency to recur. Examination three years later indicated that the patient had regained a state of normal health.

The second patient survived removal of approximately 53 per cent of the small intestine and a section of large bowel. Though he lived for four months his course was generally downhill. His nutritional disturbance was increased by a small intestinal fistula which drained more or less profusely for six weeks after operation, but it did not improve following dimunition of the drainage. Edema appeared early. The fact that the blood-serum proteins were not lower is probably accounted for by the state of dehydration. The nutritional changes were those to be expected. The development of partial intestinal obstruction necessitated operation four months later. Of particular interest was the finding of a large amount of ascitic fluid and edema of the intestines.

STEPHEN A. ZIEMAN, M.D.

Cohn, I.: Carcinoma of the Duodenum. *Ann. Surg.*, 1944, 119: 342.

The author reports 2 cases of carcinoma of the suprapapillary portion of the duodenum. This lesion is rare, insidious in character, and almost asymptomatic until it becomes obstructive. Absence of pain until the late stage of the disease is an outstanding characteristic.

The importance of being conscious of the possibility of carcinoma of the first portion of the duodenum is stressed and the diagnostic value of roentgenological manifestations is exemplified.

If carcinoma of the duodenum is to be cured, operation must be undertaken before the obstructive stage of the condition is reached.

EDWARD W. GIBBS, M.D.

Warren, K. W., and Fallis, L. S.: Perforation of Postoperative Jejunal Ulcers. *Surgery*, 1944, 15: 569.

The problem of postoperative jejunal ulcer is one of such absorbing interest as to engage the attention of the surgeon and gastroenterologist alike. Its importance is evidenced by the fact that the frequency and severity of this complication are almost solely responsible for the current disrepute of the procedure of gastroenterostomy as a means of treatment of duodenal ulcer. Recent reports make it increasingly evident that the substitution of partial or subtotal gastrectomy for simple gastroenterostomy will not, in itself, entirely eliminate this distressing consequence of gastrojejunal anastomosis. At the same time it is generally conceded that gastrectomy is less likely to be followed by jejunal ulcer than is gastroenterostomy.

By far the most dramatic, although the least common, complication of jejunal ulcer is free perforation into the peritoneal cavity.

The term jejunal ulcer is more descriptive of the lesion than is the designation of marginal or stomach ulcer. Jejunal ulcers tend to occur, and to perforate, in patients who have had previous gastroduodenal perforations. Furthermore, the patient who experiences a perforated jejunal ulcer will frequently display a distinct proclivity toward recurrent perforation.

The symptomatology of perforated jejunal ulcer is essentially the same as that of gastroduodenal rupture, with minor exceptions. The initial pain is usually located to the left of the midline and just above the umbilicus in jejunal perforation, whereas it is higher in the epigastrium and frequently to the right of the midline in gastroduodenal rupture.

The location of these ulcers is interesting and significant. Although they are commonly referred to as marginal ulcers, this is a misnomer for they occur infrequently at the stoma and only rarely involve the gastric mucosa. The lesions are found entirely within the jejunum, either opposite the anastomosis or in the efferent loop, several centimeters distal to the stoma. The afferent loop is relatively immune to ulceration. When the ulceration involves the gastric mucosa, it is believed to have originated in the jejunum, and to have spread secondarily to the stomach. These areas of localization are in accord with the well established sensitivity of jejunal mucosa to gastric secretions.

The pathology and treatment of perforated jejunal ulcers are obviously the same as those for gastroduodenal rupture.

Four examples of perforated jejunal ulcer are presented by the authors.

JOSEPH K. NARAT, M.D.

Shidler, F. P.: Aseptic Appendectomy—The Application of the Parker-Kerr Suture to the Appendical Stump. *Surgery*, 1944, 15: 634.

The Parker-Kerr suture is advocated for application to the appendical stump inversion in an effort to

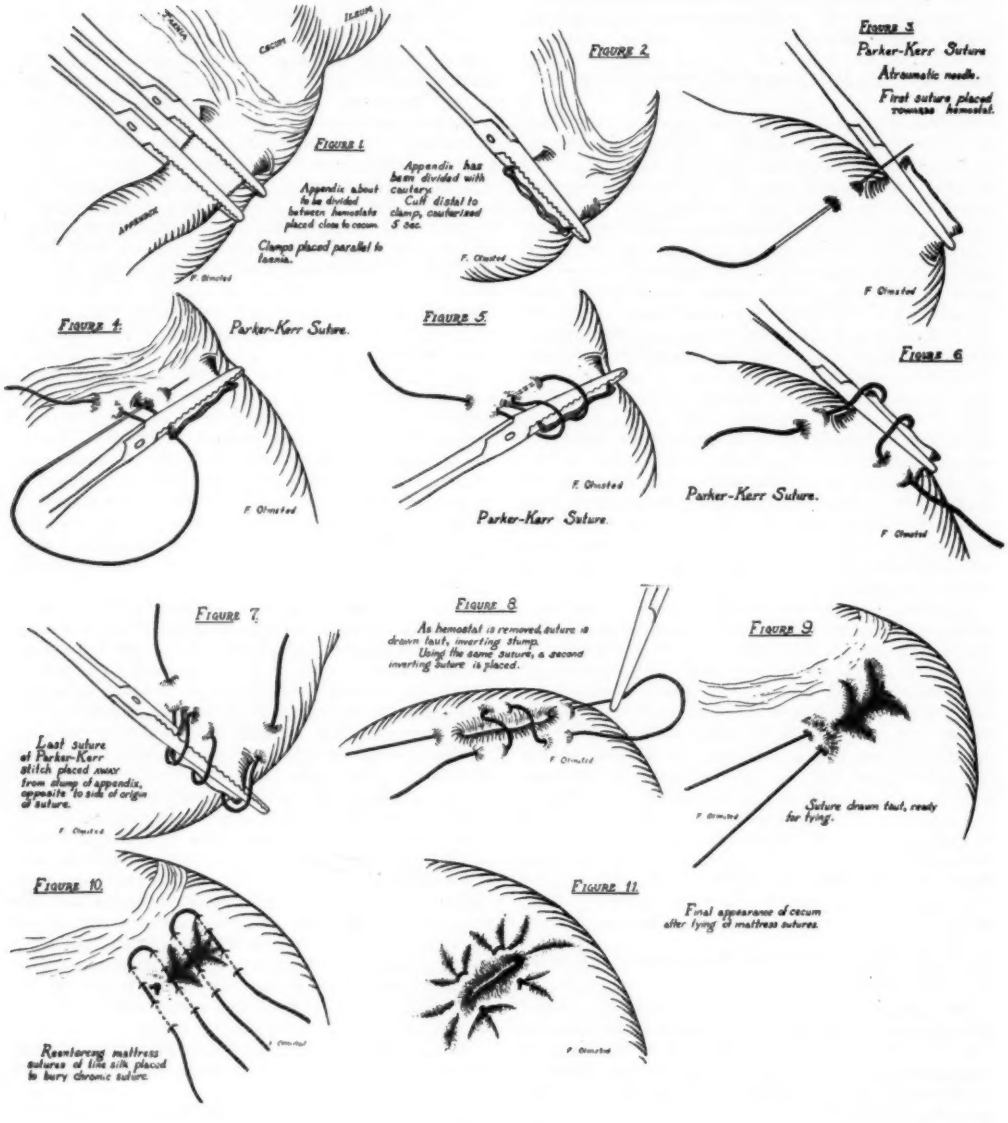


FIGURE 1
Appendix about to be divided between hemostats placed close to cecum.
Clamps placed parallel to taenia.
FIGURE 2
Appendix has been divided with cautery.
Cuff distal to clamp, cauterized 5 sec.
FIGURE 3
Parker-Kerr Suture
Atraumatic needle.
First suture placed tourniquet hemostat.
FIGURE 4
Parker-Kerr Suture.
FIGURE 5
Parker-Kerr Suture.
FIGURE 6
Parker-Kerr Suture.
FIGURE 7
Last suture of Parker-Kerr stitch placed away from stump of appendix, opposite to side of origin of suture.
FIGURE 8
As hemostat is removed, suture is drawn taut, inverting stump.
Using the same suture, a second inverting suture is placed.
FIGURE 9
Suture drawn taut, ready for tying.
FIGURE 10
Reinforcing mattress sutures of fine silk placed to bury chromic suture.
FIGURE 11
Final appearance of cecum after tying of mattress sutures.

improve the method of closure of the stump and to adopt the basic principles of aseptic anastomosis to appendectomy.

Asepsis in dividing the appendix is achieved by use of the actual cautery. The appendix is divided at the cecum so that mucocele or appendicitis of the stump is impossible. The stump of the appendix is inverted into the cecal lumen without ligation so that there is no blind pocket between the stump and the inverting suture. No unperitonealized surface of the cecum is present after completion of the procedure.

Fifteen consecutive appendectomies have been performed in this fashion without complication.

EDWARD W. GIBBS, M.D.

Linton, R. R.: Two-Stage Operation for Carcinoma of the Transverse Colon Producing Duodenocolic Fistula: Report of 2 Cases. *Arch. Surg.*, 1944, 48: 197.

The author reports the successful removal, in 2 cases, of primary carcinoma of the proximal portion of the transverse colon which had eroded the duodenum and produced a large duodenocolic fistula. Operative removal required resection of the distal portion of the stomach, the duodenum, the head of the pancreas, the terminal ileum, the ascending colon, and the proximal half of the transverse colon.

The operative procedure is described and the case histories are presented in detail. The operative procedure is divided into two stages because patients with this lesion are malnourished and because highly infectious fecal material is present in all of the lumens of the bowel which must be transected.

At the first stage the stomach and ileum are transected and a gastrojejunostomy and an ileo-transverse colostomy are made to divert the intestinal current from the duodenocolic fistula. The second stage consists of block excision of the growth and involved organs. This necessitates right colectomy and a Whipple type of removal of the duodenum and head of the pancreas.

The successful completion of this major procedure demands, in addition to technical details, adequate preoperative preparation of the patient, care during the operation, and postoperative measures to prevent shock and infection and to maintain an adequate fluid and electrolyte balance.

In the preoperative preparation, anemia should be corrected with blood transfusions, low serum-protein levels must be elevated by transfusion and amino acids, avitaminosis must be corrected with vitamins given parenterally and orally, and in some cases jejunostomy may be necessary for feeding purposes.

Since the operative procedures are lengthy, ether and oxygen administered through an endotracheal tube provides a safe and satisfactory anesthetic. Massive blood transfusions will aid in the prevention of shock.

In the immediate postoperative period additional transfusions are necessary. Oxygen is an important adjunct in therapy and sulfadiazene given intravenously is advocated to combat postoperative infection. Fluids, dextrose, and electrolytes should be given in amounts sufficient to maintain a daily urine output of 1,000 cc.

If phlebothrombosis of the lower extremities develops the danger of pulmonary embolism may be prevented by interruption of the femoral veins on both sides, and this procedure may be carried out as a prophylactic measure at the first-stage operation.

EDWARD W. GIBBS, M.D.

Hawksley, M.: Spinal Anesthesia in the Treatment of Hirschsprung's Disease. *Brit. J. Surg.*, 1944, 31: 245.

The purpose of this article is to describe fully the technique employed in spinal anesthesia in the treatment of Hirschsprung's disease, to discuss briefly some pitfalls in the diagnosis, and to show that encouraging long-term results can be expected. Twelve cases are reported in detail; 6 can be classified as cured, 3 as improved, and 1 as no better, while in the remaining 2 cases there has been insufficient time to permit judgment of the results.

The theory on which spinal anesthesia is based is that an imbalance between the two halves of the autonomic system occurs in Hirschsprung's disease, with overaction of the sympathetic. It is suggested that by temporary paralyzation of the offending half, the parasympathetic can exercise its function unchecked and on recovery of the sympathetic half the two halves are restored to normal balance. The fibers of that part of the sympathetic system concerned with the colon originate in the spinal cord from segments T-5 to L-3, inclusive, and emerge in the corresponding anterior roots. The parasympathetic system derives from the vagus and from sacral segments 2, 3, and 4; therefore, it is necessary to paralyze the anterior roots of the spinal cord up to T-5.

It is considered that stovaine and heavy percaine are unsuitable agents on account of their toxicity and the fact that only a small total quantity is required. Light percaine (1-1500) is now used and found to be highly satisfactory. This solution, however, has a specific gravity of 1.0036 as compared with that of the cerebrospinal fluid, which is between 1.004 and 1.010. The dosage is calculated either as 1 cc. per year of age of the patient or on the Howard Jones formula: the amount of percaine in cubic centimeters equals the distance in inches measured from the seventh cervical spine to the intercristal line with the back flexed, minus 6. A little ethyl chloride may be given to control a difficult patient during the injection. The injection is made with the child in a sitting position and the child is left sitting up for twenty seconds (fifteen seconds if the child is under three years), after which it is placed on its back in the reversed Trendelenburg position, that is, with the shoulders raised. This position is maintained usually for five minutes or until the child complains of pins and needles in its hands. The table is then tilted, which brings the shoulders downward. About twenty minutes or more is required before the full effect is noticed and the characteristic picture obtained. The duration of the anesthesia is about an hour and a half.

Some of the pitfalls in the diagnosis of the condition are discussed.

It seems fair from the study of these 12 cases to take a hopeful view of the effect of spinal anesthesia in Hirschsprung's disease.

MARY KARP, M.D.

Babcock, W. W.: The Elimination of Abdominal Colostomy and Other Intestinal Fistulas. *South. M. J.*, 1944, 37: 66.

The author outlines the many disadvantages to the patient, in possessing a colostomy or other intestinal fistula. Among about 500 patients operated

upon for eradicable carcinoma of the small or large intestine, there remains but 1 in whom the abdominal opening is not closed, or in the process of closing. Even when the underlying disease is ineradicable, it may be possible to eliminate a colostomy or an abdominal fistula.

A one-stage operation for carcinoma of the pelvic colon or rectosigmoid is employed, in which the mobilized sigmoid and, if necessary, also the descending colon are brought downward through the perineum, the abdominal wound being closed. A large percentage of these patients are left with functional anal sphincters. Even when it has been necessary to sacrifice the sphincter muscles because of possible invasion of carcinoma, a perineal opening has been more satisfactory than an abdominal colostomy. In resections of the small or large intestine, primary anastomoses are employed. The use of fine alloy steel-wire sutures marks an advance in the closure of fistulas of the small intestine.

ERNEST E. ARNHEIM, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Sierra, R. P., and Ardao, H.: Adenoma of the Liver (Adenoma hepatico). *Bol. Soc. cir. Chile*, 1943, 14: 534.

Hepatic adenomas are so rare that one is justified in reporting every instance of this condition. The present exemplar is a Uruguayan, a married white woman with one child born four years ago. About eight months prior to the present examination she began to experience an epigastric heaviness, which had progressively increased until recently there had been weakness, occipital headaches, chills followed by nausea, and other rather vague symptoms suggesting hepatic insufficiency.

The physical and laboratory findings, and finally those at operation were appertinent to a medium large, firm, roundish, nodulated tumor, forming one mass with the liver, external to the area of the gall bladder, which had displaced the hepatic flexure of the colon medially and downward.

Although the field was evidently richly vascularized, it was decided to dissect out the tumor mass into healthy tissue, rather than attempt an enucleation within the well developed capsule, because of the large percentage of these neoplasms which have already degenerated malignantly at operation, and because of the danger of tearing the liver parenchyma itself. Deep sutures in U form were passed around outside of the tumor mass so as to form a sort of hemostatic cradle and the excision was carried out inside of this cradle. Later these sutures were tied and other deep sutures were passed just outside of them, with which the tissues of the epiploon were packed and fastened into the large raw tumor bed. Careful hemostasis and closure were followed by uneventful convalescence.

Tissue studies disclosed young cells with nuclei and nucleoli arranged somewhat irregularly in masses, in cord-like strands, or even in radiations as though they were attempting, not too successfully, an imitation of the normal lobules of the liver. Their atypical similarity to normal liver tissue leads to the diagnosis of true hepatic adenoma.

In the subsequent discussion CHIFFLET credits himself with having previously originated a rather similar technique for controlling hemorrhage during the removal of tumors of the liver, and LARGHERO with having originated the method of employing the epiploon.

JOHN W. BRENNAN, M.D.

Womack, N. A., and Haffner, H.: Cholesterolosis; Its Significance in the Badly Damaged Gall Bladder. *Ann. Surg.*, 1944, 119: 391.

The classical form of cholesterolosis of the gall bladder generally manifests itself by a submucosal deposit of esters of cholesterol chiefly in histiocytes. These deposits are often focal in character which produces the gross appearance of a small yellow elevation when the mucosa is inspected in the fresh specimen. The histiocytes become large and foamy and are associated with a clublike enlargement of the villi. While these histiocytes represent true xanthoma cells, this phase of the cholesterolosis is but rarely associated with giant-cell reaction and fibroplasia, as is often the case in focal xanthomatous reactions in other organs. The so-called "strawberry gall bladder" is commonly found associated with cholesterol stones and as such is of great clinical importance. Cholesterolosis itself, however, has less surgical significance chiefly because of the lack of association with any great degree of inflammation in the wall of the gall bladder and, thus, its failure to produce severe symptoms.

Because of its unique clinical and pathological picture, cholesterolosis has been placed in a separate category in the classification of lesions of the gall bladder. Whereas, in times past there have been many who have considered cholecystitis primarily an infectious disease, there have been few who would deny that cholesterolosis is truly a metabolic disease —a chemical cholecystitis.

In recent publications the authors have seen reason to doubt the frequency of primary bacterial cholecystitis and they presented experimental evidence to show that other forms of cholecystitis than that of cholesterolosis or strawberry gall bladder may also be primarily chemical. When an infectious process is present they have suggested that this exists as a secondary invasion of previously damaged tissue rather than as a primary bacterial infection. They called attention to the fact that the bile itself is damaging to tissue. It sets up an inflammatory process of a type similar to that seen in cholecystitis. It produces a marked increase in capillary permeability in the region in which it is placed. This is first evidenced by edema but later there may be even diapedesis of the red cells and ecchymosis. Following the alteration in capillary permeability, definite local tissue damage is seen in the form of actual gangrene or a lesser damaging effect. This inflammatory process is associated with a cellular reaction which is

chiefly lymphocytic and histiocytic although a few polymorphonuclear leucocytes may be present. The severity of this inflammatory reaction produced by bile seemed to be in direct proportion to the concentration of cholesterol and bile salts.

Because of the similarity between such local effects of bile in tissue and the pathological picture seen in the human being in acute cholecystitis, the authors have suggested that bile itself when imprisoned in the gall bladder by obstruction of the cystic duct may set up such an inflammation in the gall-bladder wall as to produce a characteristic pathological picture of cholecystitis.

They have been able to demonstrate that complete obstruction of the cystic duct in dogs did not produce inflammation of the gall bladder if the imprisoned bile was withdrawn and replaced by an equal amount of physiological solution of sodium chloride. However, if the bile was left imprisoned in the gall bladder and the cystic duct obstructed, inflammation of the gall-bladder wall took place, and the severity of this inflammation was apparently in direct proportion to the nature and the concentration of the bile obstructed. When this concentration was as much as one time actual necrosis of the gall bladder was frequent. If obstruction of the cystic duct was not present, then the injection of such concentrated bile failed to produce any evidence of damage to the gall-bladder wall. The substances in bile chiefly responsible for such injury appeared to be cholesterol or some of the bile salts. Of the latter group, sodium taurocholate, sodium glycocholate, and sodium desoxycholate were studied. The last seemed to be the most damaging.

From these studies it seemed fair to conclude that three important factors were involved in the production of cholecystitis. These factors were: obstruction of the cystic duct, the action of bile on the gall-bladder wall, and the occasional secondary presence of bacterial infection which would be superimposed upon a chemically damaged tissue. While the bacterial infection is often so great as to overshadow all of the other factors, in all probability it is usually preceded by chemical damage.

In a previous study the authors made an attempt to find a reaction to lipoid material in the human gall bladder. The reaction consisted generally of edema, fibrosis, and a hystiocytic response, as inflammatory cells, xanthoma cells, or giant cells.

In this study, 354 gall bladders which were removed consecutively at the Barnes Hospital, St. Louis, Missouri, from January 1939 to August 1943 are included. Blocks of tissue were taken from the fundus and neck of the gall bladder. Of these, 116 (32.8 per cent) showed some evidence of lipid or bile reaction. In this group were included the cases of so-called cholesterolosis or strawberry gall bladder, of which there were 36 (10.2 per cent). In the remaining 80 cases (22.6 per cent) of the material studied, there was easily demonstrable in the gall-bladder wall, evidence of tissue damage due to the presence of what was apparently cholesterol, cholesterol esters, or inspissated bile itself. These substances were almost universally found to be associated with severe damage to the gall-bladder wall. In no instance were they noted deep in the wall in the absence of severe tissue reaction. An effort was made to identify the type of lipid present by histochemical means. There was, however, such considerable variation in the staining reactions that accuracy in the identification of the lipids was questionable. Perhaps the most common finding was that of lipid esters, presumably cholesterol esters in the cytoplasm of histiocytes resembling those found in the submucosa in strawberry gall bladder. As a general rule, there was a considerable amount of fibroplasia seen around such areas of xanthomatosis. When there was no evidence of extracellular accumulation of lipids the tissue reaction was not so acute. One of the most common of such extracellular substances was free cholesterol.

It was not an unusual finding to encounter deposits of what apparently was free cholesterol in the gall-bladder wall not associated with a considerable xanthomatus reaction. Such deposits were probably most frequently encountered in the subserosa rather than in the submucosa. In several instances there was evidence of metastasis of the cholesterol to the regional lymph nodes.

Xanthomatosis also often occurred in association with clear, regular deposits of a brilliant orange-colored substance having the appearance of bile. This was considered an extravasation of bile into the gall-bladder wall. When it was found associated with xanthomatosis the tissue reaction was often violent. What apparently are deposits of bile may occasionally be encountered in the gall-bladder wall without an associated xanthomatous reaction.

Some of the most characteristic microscopic pictures are described in detail. These data are offered as additional evidence that bile plays a dominant part in the production of cholecystitis.

LeRoy J. Kleinsasser, M.D.

Belchor, G.: Stricture of the Common and Hepatic Bile Ducts (Estrechez del colédoco y conductos hepáticos). *Sem. méd.*, B. Air., 1944, 51: 316.

The author reports 25 cases of stricture of the common and hepatic bile ducts operated upon in the Cleveland Clinic since 1941. Corresponding to a greater frequency of surgical diseases of the biliary tract among women, 21 strictures were encountered in female patients and 4 in male patients; the youngest patient was twenty-two and the oldest sixty-five years of age.

The condition must be differentiated from hepatitis, cholangitis, malignant tumor, or a residual stone overlooked at the time of operation.

With few exceptions, stricture is a postoperative complication. Anomalies of the course or length of the cystic duct are an important factor. A common duct forming a more acute angle with the cystic duct than is usually the case may inadvertently be clamped off or an oval segment of it may be excised.

Another circumstance frequently responsible for a stricture is the attempt to catch the cystic artery in the presence of a hemorrhage in the course of cholecystectomy.

An inflammatory reaction in the subhepatic fossa which makes the dissection difficult, or an anomaly of the origin or course of the cystic artery are other important factors.

An inflammatory process may destroy the mucosa of the common or hepatic duct and lead to cicatricial stenosis.

An ulceration caused by a stone may also be followed by a constricting scar. Postoperative bands and adhesions may produce a stricture, and a blow on the abdomen may result in a constriction of the common duct. Exploration of the common duct or an operation on the duodenum may be followed by the formation of a stenosis.

The location and size of the stricture vary greatly. As a rule, a stenosis caused by an attempt to stop a hemorrhage is located in the hepatic duct, while an ulceration due to a stone is apt to form a stricture in the region of Vater's papilla. An inflammatory process may be followed by a diffuse stenosis of a great portion of the biliary tract.

As to the diagnosis, progressive jaundice of an obstructive character, discolored stools, choluria, and pruritus are suggestive symptoms. Colicky pains were recorded in only 1 case in the author's material; 6 patients complained of moderate epigastric pain, and 9 showed signs of infection. Nausea, vomiting, constipation, and loss of weight may be noted. Bleeding gums, menorrhagias, and ecchymoses, attributable to a hepatic insufficiency, were noted in 1 case.

In the author's material only 1 patient developed stricture without having had a previous operation. The treatment is surgical. Preoperative care is essential because usually the resistance of the patient is lowered. Among the innumerable methods of treatment the following may be mentioned: cholecystoduodenostomy; hepaticoduodenostomy; implantation of the fistula into the stomach, duodenum, or small intestine; dilatation, and plastic operation.

If the stricture is located in the vicinity of the papilla of Vater, a choledochoduodenostomy is the method of choice. The T-tube may remain several months in some circumstances.

If the stricture is located at the junction of the common and hepatic ducts or if an extensive stenosis of the common duct is present, a hepaticoduodenostomy should be performed.

If a circumscribed stricture in the central portion of the common duct is present, an end-to-end anastomosis of the duct may be performed. The advantage of this operation lies in the fact that the sphincter of Oddi remains intact and the preservation of its function prevents an ascending cholangitis.

If no portion of the common duct is suitable for anastomosis, an implantation of a fistula, previously formed by the insertion of a catheter, into the gastrointestinal tract may be considered. In some cases the Heinecke-Mikulicz operation may be performed; this consists of an incision in the longitudinal direction and suture in the transverse direction.

If the gall bladder is preserved, a cholecystogastrostomy or cholecystoduodenostomy may be planned.

The reconstruction of the common duct with vitallium tubes is an operation of recent origin; the metal alloy does not deteriorate, does not cause a precipitation of the bile salts, and has no electrolytic effect. In the author's group of cases vitallium was used in 4 patients. The time of observation is too short to permit a definite opinion as to the value of this method.

To prevent an injury of the common or hepatic duct while an attempt is made to stop a hemorrhage from the cystic artery, the author advises the introduction of the left index finger through Winslow's hiatus for the purpose of compressing the hepatic artery.

If a second operation is performed, a V-shaped rubber tube instead of a T-tube should be used to avoid trauma of the anastomosis when the tube is withdrawn. A cholangiogram should show satisfactory conditions before the tube is removed.

JOSEPH K. NARAT, M.D.

Sanders, R. L.: Surgical Indications in Diseases of the Common Bile Duct. *Ann. Surg.*, 1944, 119: 384.

The chief conditions for which operations on the ducts are performed are: (1) stones, (2) carcinoma, (3) stricture, and (4) pancreatic lesions. The author reports his experience in the last eleven years, during which time 596 operations were performed upon the biliary tree, 575 of this number for benign disease of the gall bladder and ducts. Of the 575, 538 were primary operations and 37 were secondary. The ducts were opened and explored 77 times, or in 13.4 per cent of the 575 cases. Sixty-one of the choledochotomies were primary and 16 were secondary. There were 17 fatalities, or 3.4 per cent, following the gall-bladder operations without exploration of the ducts. Compared to this, there were 8 fatalities (10 per cent) following cholecystectomy or cholecystostomy with choledochotomy. Thus, the mortality rate was almost three times higher in the latter group.

Stones were found in the gall bladder in 328, or 57 per cent, of the 575 cases, and stones were found in the duct in 54, or 70 per cent, of the 77 cases treated by choledochotomy.

The mortality rate for the choledochotomies which revealed stones was 6.8 per cent as compared to 2.8 per cent for those in which no stones were recovered. The author does not believe that the presence of stones has any bearing as to the outcome, except insofar as they are usually associated with long-standing disease.

Until recently, the author's criteria for exploring the common duct in cholecystic disease consisted

largely of the palpation of a stone and jaundice. Lately, however, he has been guided by the following findings: (1) palpation of the stone in the duct; (2) jaundice, or a history of jaundice; (3) a contracted gall bladder, (4) abnormal dilatation of the ducts; and (5) aspiration of flocculent bile from the duct. For purposes of comparison and to show his more recent experience, he has divided the total of 538 primary gall-bladder operations into two groups —those performed prior to June, 1941 (383), and those performed since that date (192). The mortality in the first group was 5 per cent and in the second group, 3.1 per cent. In the first group the duct operations were considerably fewer in proportion than in the second group (35, or 9 per cent of the 383 gall-bladder operations performed over a period of almost nine years). In the second group of 192 operations, performed within a little more than two years, the duct was explored 42 times in association with operations for cholecystitis, or in 21 per cent.

In the first group, stones were found in 74 per cent of the 35 cases, whereas they were found in 60 per cent of the second group of 42 cases. Although the percentage of choledochotomies was much higher in the second group, the percentage of stones was less. From this experience, the author concludes that the necessity of subjecting patients to choledochotomy without clear indication, even though the risk is small, is very limited. The author also concludes from his experience that the finding of a dilated duct is of little significance, as one was found to be present in 80 per cent of the cases. In the absence of jaundice and a palpable stone, the author's criteria for opening dilated ducts have been the discovery of a contracted gall bladder, small stones in the gall bladder with an enlarged patent cystic duct, the presence of flocculent bile in the ducts as determined by aspiration, and a history of chills and fever.

Some degree of hepatitis or pancreatitis, unassociated with jaundice, has been encountered in a high percentage of the cases of this entire series. As a rule, the author believes that the duct should be opened in cases with these conditions as the inflammatory process will subside following cholecystectomy alone.

Duct stones were recovered in 10 of the 16 secondary operations on the ducts. The obstruction was caused by adhesions in 1 case, by stricture in 3 cases, by pancreatitis in 1 case, and apparently by spasm of the sphincter in 1 case.

In recent years he has made a practice of dilating the lower end of the duct to almost normal size with Bakes dilators, when possible. The author also emphasizes that it is important to obstruct the cystic duct before the common duct is opened, or to remove, as he prefers, the gall bladder before the common duct is opened, because if the gall bladder is manipulated after the common duct has been opened and sutured, stones may be passed into the common duct and thus account for some of the recurrences.

By far the majority of duct strictures arise from operative trauma incident to clamping of the ducts in an effort to control hemorrhage from an accidentally injured artery. Such accidents are especially likely when the ducts and arteries are abnormally situated. The author encountered anomalies of these structures in fully 50 per cent of his cases. Three patients (0.5 per cent) of this series came to operation for partial stricture of the duct, all following surgery.

The common duct is one of the rarest locations for malignant disease. Two or 0.3 per cent of the patients in the present series of 596 had carcinoma of the common duct. In 1 the tumor was found in the common duct at its junction with the cystic duct, and extended backward into the liver. A cholecystogastrostomy was performed and the patient died subsequently after leaving the hospital.

In the second case an extensive carcinoma in the midportion of the duct was found. A part of the growth was encroaching upon the gall bladder and the liver. As much of the growth as possible was excised, a hepaticoduodenostomy was performed, and the gall bladder was drained. This patient died at home several weeks later.

No duct stones were found in either case and the author believes that this tends to bear out the observation that there is no direct association of duct stones with carcinoma of the ducts such as is observed between gall stones and carcinoma of the gall bladder. The author also reports having done 2 choledochoduodenostomies for carcinoma. In an additional 12 cases, cholecystogastrostomies were carried out. There were no hospital deaths in any of the group of 14. LeRoy J. Kleinsasser, M.D.

GYNECOLOGY

UTERUS

Bazterrica, E., and Monserrat, M. R.: The Treatment of Hemorrhagic Metropathy with Insulin (Tratamiento de la metropatia hemorragica por la insulina). *Rev. méd. quir. pat. fem.*, B. Air., 1943, 10: 449.

The authors' experience in the treatment of hemorrhagic metropathy with insulin is discussed. They find that insulin seems to have an action antagonistic to that of folliculin. The ovarian cycle is retarded and ovulation restrained by the use of insulin.

They give an injection daily or twice a day, morning and evening. The beginning dose is 5 or 10 units, and this is increased 10 units a day, or the same dose is repeated, according to the effect, until 30, 40, or 50 units a day are being given. When the flow stops the medication is discontinued until eight days before menstruation in the next month, when it is given as before, and this is kept up for three months. General tonic treatment, air, sunshine, and psychotherapy should be given in association with insulin treatment.

Illustrative cases are given. They have treated numerous cases but do not give the number. The results have been good in cases of hemorrhagic metropathy of ovarian origin. If there are organic lesions, such as myomas, placental rests, new growths, and polyps, the treatment has no effect. The results are better in hemorrhages in young patients than in those nearing the menopause. The treatment must be kept up for a long time.

AUDREY G. MORGAN, M.D.

Behney, C. A., and Howson, J. Y.: Carcinoma of the Cervix; End-Results. *Am. J. Obst.*, 1944, 47: 506.

The "five-year arrest" as a standard for comparison of therapy of cervical carcinoma has many limitations. Treatment with a high primary mortality rate, or frequent undesirable complications, though it result in many "five-year cures," may be less desirable than another type of treatment involving a lower initial mortality and fewer complications, but yielding a smaller number of patients symptom-free five years after treatment. The objective in cancer therapy should be not only to arrest the condition permanently in a great percentage of cases, but also to render the incurable patients useful and comfortable as long as possible. The authors believe that it is proper to consider the duration of life after admission in appraising the results of any form of therapy.

Previous to 1928, cancer of the cervix in stages I, II, and III was treated with radon in a cervical T-tube and filtration of 0.5 mm. of silver, 1 mm. of brass, and 2 mm. of rubber. The dosage was 2,400 mc.-hrs. Perforation of the uterus, peritonitis, and septicemia occur in the stage IV cases following the use of radon and therefore most of these cases received no treatment. Some were given high-voltage x-ray therapy through two or four external ports.

From 1928 to 1931, all patients whose general condition permitted were treated with high-voltage therapy, regardless of the extent of the disease. The usual dosage consisted of from 1,600 to 1,800 roentgens (air) to each of from four to six fields, 15 by 20 cm. In the late stages, this was the only form of treatment given. Lesions in the first, second, and third stages were treated with radon in the cervical and uterine canal, and against the vaginal portion of the growth, and high-voltage roentgen rays were also used. The intracervicouterine application was made with a filtration of 0.5 mm. of silver, 1 mm. of brass, and 2 mm. of rubber. The dosage ranged between 2,000 and 3,000 mc.-hrs., and depended upon the depth of the cervical canal. The vaginal application of radon was made in three sittings. One thousand millicurie hours of radon with a filtration of ½ mm. of silver and 3 mm. of lead, and rubber at a distance of 1 cm. were given, the rays to strike transversely against the cervical growth and into each vaginal fornix, to provide a three-directional cross-fire, totaling 3,000 mc.-hrs. The high-voltage x-ray therapy was administered with the four-to-six-field technique developed by Weatherwax and Widmann.

Since 1931, many patients with stage IV carcinoma responding favorably to x-rays were subsequently treated with the standard dosage of radon given into the uterine and cervical canals and against the vaginal portion of the cervix, and from six to eight weeks later a second course of high-voltage irradiation was given. Since 1938, an ever-increasing number of patients has also been treated with transvaginal high-voltage x-ray therapy.

From 1931 to 1942, 579 patients treated on the radiological service of the Philadelphia General Hospital died. The results in this group are compared with those obtained between 1922 and 1931, when different radiological techniques were practiced.

Since 1931, 5 patients with stage I carcinoma have died. One patient died from gangrene of the foot without treatment for the carcinoma. Four treated patients lived an average of nine and one-half months after treatment as compared with the single patient with stage I carcinoma in the earlier group who survived for twenty-one months.

Of the 27 patients with stage II carcinoma, 1 refused any treatment and another refused high-voltage x-ray therapy. The average life span after admission for the 20 patients in this stage who were treated with high-voltage x-ray therapy and radon was seventeen and two-tenths months. Five other patients whose treatment was incomplete averaged only six and eight-tenths months of life. In the previous report, 3 patients with stage II carcinoma lived an average of thirteen and three-tenths months.

Eleven patients with stage III carcinoma received no treatment at all, and their average life duration was four and six-tenths months; 12 who were treated only with radium lived nine months after admission. Ninety-nine patients receiving external irradiation and radon died an average of eighteen and eight-tenths months after treatment, and 46 patients who were treated only with high-voltage x-rays, externally or transvaginally, lived an average of ten and eight-tenths months. By comparing the survival time with that in the earlier group, it will be seen that the 99 patients receiving standard treatment with x-ray and radon lived an average of seven months longer than the group reported in 1931. Forty-six patients treated with only high-voltage x-rays, externally and transvaginally, lived for an average period of four months longer than the 1931 group.

There were 260 patients with stage IV carcinoma since 1931. Eighty-five received no treatment, with an average duration of life of one and eight-tenths months. Four patients had intravaginal applications of radon and lived an average of eight and sixty-six-hundredths months. In 10 patients, following high-voltage x-ray therapy, the tumor had regressed so that the cervix was again movable, and these patients were subsequently treated with radon. They lived an average of thirteen months. One hundred and sixty-one patients treated with external high-voltage therapy alone lived an average of seven and nine-tenths months. While the average duration of life of the patients with stage IV carcinoma who received no treatment was practically the same as that of the group reported previously, those treated with radon heavily filtered and applied at a distance, lived more than twice as long as those with stage IV carcinoma in the 1931 group who were treated intracervically with lightly filtered radon. The patients in the present study with stage IV carcinoma who were treated with x-ray therapy and radon also lived twice as long as those previously reported.

One hundred and eighteen cases were classified as in Stage V. Sixty untreated patients survived an average of two and four-tenths months. Seven patients after being treated with high-voltage x-ray therapy were regarded as suitable for subsequent radon irradiation. Their average survival time was fourteen and one-tenth months. The remaining 52 patients were treated with high-voltage x-ray therapy only. Their average life duration after admission was twelve and four-tenths months.

The present report demonstrates the value of high-voltage roentgen therapy in the treatment of carcinoma of the cervix. The best results were secured in the group which, after regression of the primary lesion had been brought about by preliminary high-voltage x-ray therapy, was subsequently treated with heavily filtered radon at a distance of 1 cm. Since this fact became apparent, it has become the policy to administer external high-voltage x-ray therapy before the radon application in every case of carcinoma of the cervix. The longer duration of life in patients in the recent series who were treated with high-voltage x-ray therapy, regardless of the stage of the disease, can be attributed to the fact that they were given more adequate dosage than those of the 1931 study. J. Robert Willson, M.D.

MISCELLANEOUS

Gosende, J. C.: The Uterine Musculature of the Newborn Child (La musculatura del utero de la recien nacida). *Rev. méd.*, Rosario, 1944, 34: 123.

The author describes histological studies made of the uterine musculature of fetuses of four, five, and seven and one-half months and that of newborn infants who died during labor or were born asphyxiated and could not be resuscitated. Specimens are described and illustrated with photomicrographs.

The classical study of the uterine musculature of the adult made by Helie and Chenantais in 1864 divides the musculature into three layers. This is not the picture in the uterus of the newborn child. There are only two layers: (a) an external longitudinal one, which extends the whole length of the uterus from the fundus to the portio, and (b) an internal layer, originally circular, which has been deformed until it presents a rectangular appearance and occupies only the body and the fundus of the uterus.

The external longitudinal layer sends out muscle fascicles throughout its course which run in all directions perpendicular and oblique to its axis, and extend particularly toward the interior of the uterus, mingling with the internal muscle layer. They also extend to the endometrium and help to form the musculature of its folds.

Only the external longitudinal bundle extends to the portio, turning on itself and again giving off fascicles which form a pseudoreticular layer and spread out in a fan shape. The external longitudinal bundle is also prolonged downward, to form the muscular layer of the vagina. The middle portion of the external longitudinal bundle changes its direction when it reaches the isthmus and forms a thick, circular bundle at this site.

The internal circular muscle is deformed by being mixed with the fascicles sent out from the external longitudinal bundle and by the presence of vessels and venous sinuses which give it a reticulate or whirlpool-like appearance. The internal circular muscle also sends out fascicles which help form the musculature of the folds of the endometrium. The internal circular muscle does not receive muscle fibers from the vessels and venous sinuses, which have their own musculature. This does not have any effect on the uterine musculature but to push aside the muscle bundles and change their course. The internal circular muscle forms a part only of the body of the uterus. Audrey G. Morgan, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Dippel, A. L.: The Relationship of Congenital Syphilis to Abortion and Miscarriage, and the Mechanism of Intrauterine Protection. *Am. J. Obst.*, 1944, 47: 369.

A series of 68 fetuses of nonsyphilitic women, and 67 of leutic women were subjected to autopsy and certain tissues were searched for the presence of spirochetes. Only fetuses which had not reached viability were included in the study.

Fetal syphilis was diagnosed upon the discovery of spirochetes in the fetal organs. No other criterion was considered reliable for the diagnosis from autopsy material. Spirochetes were generally found in largest number in the perivascular tissues of the liver and lungs. The long bones, placenta, and umbilical cord harbored the fewest number.

The characteristic morphology of the spirochaeta pallida was not found in 3 macerated fetuses from missed abortions. That the observed structures were dead or dying spirochetes was proved by comparison with the changing morphology in an aging dark-field preparation. No spirochetes were found in the stained preparations from the 68 fetuses of nonsyphilitic women. Spirochetes found in the tissues of fetuses from leutic mothers (cases in which the blood Wassermann reaction was positive, as well as those in which the serum had been rendered negative by therapy) were morphologically like the spirochaeta pallida and were considered as such since no spirochetes of any form were seen in the fetuses of nonleutic mothers. Spirochetes were found in 16 of the 67 fetuses of leutic mothers, an incidence of 23.9 per cent, which demonstrates the role played by syphilis in the production of abortion and miscarriage in this series. Spirochetes were discovered in 14 of 42 fetuses from Wassermann-positive mothers (33.3 per cent), and in 2 of 9 fetuses from Wassermann-negative mothers (22.2 per cent), which confirms the theory that negative serum following antiluetic therapy is no assurance against congenital syphilis. Spirochetes were not found in fetal tissues prior to the eighteenth week of gestation, i.e., in the abortion period. The incidence of fetal infection with spirochetes was found to rise from 10 per cent in the first half of the miscarriage period to 50 per cent in the latter half of that period with the highest incidence (66.7 per cent) in the twenty-sixth week. Appropriate conclusions relative to the role played by syphilis in terminating pregnancies before viability are drawn.

The limited material of this study suggests that there is some natural protection of the fetus against syphilis during the first seventeen weeks of pregnancy. However, Wassermann-positive mothers must receive therapy before the eighteenth week if their fetuses are to be guarded against syphilitic infection, and both Wassermann-positive and -negative gravida must have therapy before the twenty-third week, or approximately 50 per cent of their fetuses can be expected to be infected before viability is reached.

This confirms the modern teaching that antisyphilitic treatment must be started early in pregnancy and certainly before the eighteenth week of gestation. Evidence is offered to show that the Langhans layer of chorionic epithelium affords appreciable protection to the fetus against the invasion of the spirochaeta pallida, even after the sixteenth gestational week. At this stage it is in the form of delayed delamination and differentiation of the Langhans cells. EDWARD L. CORNELL, M.D.

Weaver, H. M., and Steiner, G.: Acute Anterior Poliomyelitis during Pregnancy. *Am. J. Obst.*, 1944, 47: 495.

Acute paralytic anterior poliomyelitis as a complication of human pregnancy raises several questions: (1) Does pregnancy affect the susceptibility of the mother to the disease? (2) Is the disease transmissible from mother to fetus in utero? (3) Is the disease transmissible to the offspring through the secretions of the mammary glands? The present communication records experiments and results pertinent to these problems.

THE EFFECT OF PREGNANCY ON THE SUSCEPTIBILITY OF THE MOTHER

A 10 per cent, unfiltered suspension of the virus of poliomyelitis was made from the glycerinated brain stems and spinal cords of cotton rats paralyzed by treatment with the Armstrong-Lansing strain. Each of the cotton rats in this experiment was given a single three-way inoculation (0.1 cc. intracerebral, 0.5 cc. subcutaneous, 0.1 cc. intranasal) of virus.

Sixty-four cotton rats of comparable ages were used in this experiment. The twenty-eight day gestation period of these animals was divided into trimesters for the purpose of comparing the relative susceptibility at different stages of pregnancy. Three groups of animals were observed. Group 1 included the pregnant animals with viable fetuses and those which had delivered viable young within twenty-four hours. Group 2 included animals with fetuses which had been resorbed (autopsy). Group 3 included virgin female cotton rats as controls.

Results. The average incubation period and extent of paralysis in each of the three groups was not significantly different. The only animals which developed no symptoms of poliomyelitis were 3 of 13 animals inoculated with the virus during the first trimester of pregnancy.

INTRAUTERINE TRANSMISSIBILITY OF THE VIRUS

The fetuses from 15 cotton rats paralyzed following a three-way inoculation with the Armstrong-

Lansing strain of the virus of poliomyelitis were removed from the fetal membranes as rapidly as possible after the death of the mother. The central nervous systems of the fetuses in each litter were made into a 10 per cent suspension with normal saline solution, and each of these suspensions was inoculated into 2 or 3 previously untreated cotton rats. Of 31 animals so inoculated, 5 were sacrificed because of clinical manifestations within a period of time equal to the usual incubation period of the virus. Of these 5 animals, 2 only appeared to be clinically paralyzed. Microscopic sections from samples of the central nervous systems of the 5 animals which had exhibited clinical manifestations revealed no histopathological changes suggestive of anterior poliomyelitis.

A further passage into previously untreated cotton rats was attempted from each of 4 of the 5 animals which had exhibited clinical manifestations. Of 9 animals so treated, only 1 died. This animal exhibited no symptoms whatsoever of anterior poliomyelitis, and examination of the entire nervous system of this cotton rat revealed no evidence of the disease.

TRANSMISSIBILITY OF THE VIRUS THROUGH MAMMARY SECRETIONS

Two mother cotton rats were inoculated with the virus of poliomyelitis twenty-four hours after birth of their young. The offspring received nourishment from their mothers until the latter expired with poliomyelitis. In the first case the mother lived for eight days and in the second case for eleven days after the young were born. Each mother appeared to satisfy the nutritional demands of her offspring until about forty-eight hours prior to her death. Artificial feeding of the offspring was successful and they grew normally and without loss. None of the offspring showed any evidence of paralysis nor any resistance to inoculations with potent suspensions of the virus administered twenty-five days after the death of the mother.

It is conceivable that during pregnancy an altered susceptibility to paralytic anterior poliomyelitis might result from an alteration in the permeability of the portal of entry of the virus and/or a change in the effective "internal resistance" of the host. Of the cases of paralytic poliomyelitis in the human being which were contracted during pregnancy, only 17.1 per cent occurred within the first trimester when the formation of chorionic gonadotropin is at its peak. In this connection, the only pregnant cotton rats resistant to the first inoculation with the virus of poliomyelitis were 3 which were inoculated between the fourth and seventh days of pregnancy. That these animals were temporarily resistant to the inoculum only is demonstrated by the fact that each became completely paralyzed following a second three-way inoculation with the virus of poliomyelitis administered between fourteen and twenty-one days later. More than 300 untreated and nonpregnant cotton rats of all ages were inoculated with the virus of poliomyelitis, and of these, 2.86 per cent of the males and 2.53 per cent of the females resisted their first exposure to the virus, but succumbed, with complete or partial paralysis, to a second inoculation. In contrast to these, 23.08 per cent of the pregnant cotton rats inoculated during the first trimester of pregnancy resisted the virus.

It would appear from the information at hand, that chorionic gonadotropin, or some substance associated with the formation or metabolism of this hormone, might play a role in increasing the resistance of the pregnant female during the first trimester of pregnancy to the virus of poliomyelitis. The experiments reported indicate that in the cotton rat infective quantities of the Armstrong-Lansing strain of the virus of poliomyelitis are not transmitted from a mother to the nervous tissues of a fetus in utero, nor is the virus transmissible to the offspring through the secretions of the mammary glands.

J. Robert Willson, M.D.

MISCELLANEOUS

Brown, R. L.: The Rate of Transport of Spermia in the Human Uterus and Tubes. *Am. J. Obst.*, 1944, 47: 407.

From complete abdominal hysterectomies at the Barnes Hospital, St. Louis, Missouri, Gynecological Department, six uteri with tubes were made available for the determinations made in this study. The experiments were started from one to three hours following the excision. The uterus, in each instance, was warmed to body temperature in a 37° C., physiological saline solution during the determinations. During each experiment the uterus and tubes were wrapped in warm saline compresses. The angles were adjusted to simulate the normal in-vivo position of the uterus and adnexa. A 2-cc. pool of sperm (one half to three hours postejaculatory) was placed in an appropriate receptacle at the cervical end of the excised uterus.

The average time, in three determinations, for human spermia to traverse the excised human uterus and tubes at near in-vivo conditions was sixty-nine minutes. For twenty-seven minutes the spermia were in the uterus, and for forty-two minutes they were in the fallopian tubes (interpolation). The average distance traversed was 189 mm.: 84 in the uterus and 105 in the tube. The average distance in millimeters per minute was 2.7. The average time for ejaculated spermia to reach the ovum in women varies between sixty-five and seventy-five minutes (interpolated).

Edward L. Cornell, M.D.

GENITOURINARY SURGERY

BLADDER, URETHRA, AND PENIS

Munger, A. D.: Bladder Injuries, Including Spinal-Cord Injuries as Related to War and Civil Practice. *J. Am. M. Ass.*, 1944, 124: 1120.

The distended bladder has a decidedly increased liability to rupture in circumstances of trauma to the lower abdomen, and unless there is an associated fracture of the pelvis the empty bladder is very rarely ruptured.

Fractures of the pubis and the combined fracture of the iliac and pubic portions of the pelvic girdle are the types of fractures which are especially prone to be complications of a ruptured bladder.

The severity of the osseous injury varies from simple perforation or mere notching to that of fragmentation with spicules of bone driven into the cavity of the bladder. Bone rarefaction may occur with subsequent development of osteomyelitis and sequestration. Bone damage augments the risk and severity of bladder sepsis, with resultant formation of sinus tracts and prolonged discharge of urine and pus from the wound made by the missile or from the openings on the skin of the groin, perineum, or of the thigh as the result of the diffusion of the infection.

Because of the awareness that bladder injuries are usually complicated, the long held concept of intraperitoneal and extraperitoneal damage as a simple lesion per se is revised.

The symptoms of intraperitoneal wounds of the bladder vary according to the course and size of the lesion, the most noticeable being the urgent desire to urinate and usually the inability to do so. Frequently only a small amount of bloody urine can be expelled. Blood in the bladder is always present but frequently cannot be ascertained except by catheterization. Catheterization may reveal fecal material and gas formation in the bladder, which denotes a communicating injury of the rectum. With a catheter *in situ*, an anterior and lateral x-ray examination with air injection or the instillation of a dilute nonirritating opaque medium such as diodrast will establish a diagnosis.

To the credit of ever-improving surgical techniques, the prognosis in bladder injuries with plurivisceral damage is no longer "dismal in the extreme." In the early hours after the wounding, the surgeon's activities are now directed toward the immediate saving of life by recovery from shock, systemic antisepsis, and adequate drainage, succeeding all of which deliberate reparative surgery can be instituted.

Perforation of the small intestine is most common, but the large intestine and rectum are injured with great frequency. In urgent traumatic surgery of the abdomen no operation is complete until the bladder has been thoroughly inspected. Frequently an unsuspected gunshot wound of the bladder is discovered during the laparotomy. The bladder should be sutured whenever the condition of the patient and the accessibility of the vesical wound render this possible. Intraperitoneal wounds present no difficulty unless the rent is situated at the bottom of the pouch of Douglas. When suture is deemed too difficult, an adequate suprapubic drainage tube must be instituted to permit ample perivesical drainage to the site of the wound.

An indwelling catheter through the urethra has many drawbacks in the transport and handling of wounded men and in warfare greatly augments the risk of severe urinary sepsis. When the bladder and pelvic rectum are both wounded, suture of each viscus must be performed. In injuries of the perineal rectum and the extraperitoneal part of the bladder, suture may be very difficult. In such instances adequate perineal, perivesical, and suprapubic vesical drainage must be instituted. When stabilization and a more favorable surgical environment occur, a perineal rectovesical repair can be done.

The concussion rupture of the bladder most usually fragments the structure. In such instances all mucosa should be jealously preserved, and great caution should be used in removing any tissues near the rupture.

Extraperitoneal wounds of an uncomplicated character produce blood in the urine, difficult urination, and extravasation. There may be few symptoms at first, but under observation, if extravasation is occurring, suprapubic discomfort and a palpable mass appear. Wounds occurring in the buttocks, thighs, hips, perineum, or genitalia with remote evidence of abdominal symptoms are suggestive of extraperitoneal rupture and should be carefully investigated. In extraperitoneal ruptures the urinary extravasation will follow the fascial planes.

Extravasation from a bladder rent occurring in the front may travel upward between the peritoneum and the abdominal muscles, or, if the rent is more posterior, the extravasating urine may dissect extraperitoneally along one or both ureters, forming a bulging palpable mass in one or both flanks. Retrovesical extravasation may pass through the sciatic notch to the buttock, through the obturator foramen to the thigh, or through the inguinal canal to the scrotum.

Necessary primary surgical intervention is best carried out at the advanced surgical hospitals at the front. With no evidence of intraperitoneal injury and adequate urinary drainage established, a "hands off" policy may be assumed until the patient reaches a more favorable surgical environment; otherwise, should there be apparent danger of extravasation, expeditious surgical intervention should be instituted by suprapubic tube and adequate regional drainage.

THE TRAUMATIC-CORD BLADDER

A second and equally distressing problem pertaining to the bladder in warfare is the spinal-cord injury with the bladder sequelae arising from it. Much desultory writing has been presented in urological literature, with but little attempt at correlation.

Injuries to the spinal cord produce bladder paralysis by severing the continuity of the reflex arc controlling the act of voiding, and consequent urinary retention results. The bladder rapidly distends to such formidable size as to establish fear of rupture. If the injury is above the eleventh dorsal segment, an overflow dribbling quite readily occurs; conversely, an injury below this level is likely to establish a spasm of the vesical sphincter.

In the author's experience rarely did a patient with a spinal injury arrive at the base without having been catheterized from one to several times. Every one presented severe sepsis. The patients reaching the base hospital who fared best clinically were those who had had early suprapubic drainage, and even those already severely infected who were subjected to suprapubic drainage, with its attendant increased facility for antisepsis, revealed a sharp reversal of the mortality rate.

With the knowledge that over 50 per cent of orthopedic and industrial surgeons interviewed in civil life are votaries of some type of catheter drainage and knowing as we do that the catheter is "the grand executioner" in a great number of these cases, the author advocates the revival of Sir Thompson Walker's dictum of immediate suprapubic drainage.

JOHN A. LOEF, M.D.

MISCELLANEOUS

Lazarus, J. A.: Bacillus-Welchii Infections Complicating Surgical Procedures upon the Upper Urinary Tract. *J. Urol.*, Balt., 1944, 51: 315.

Gas-bacillus infections complicating surgery of the upper urinary tract are rare. Although gas-bacillus infections may be due to a variety of organisms, the predominating one is the bacillus welchii. This organism has been found in tissues recovered from patients who presented no clinical evidence of wound or systemic infections. It has also been found in 4 renal calculi, but in only 1 of these was it associated with wound infection. In this instance the stone was fragmented during its removal.

While the usual incubation period varies from one day to six days, the average being three days, it has been known to be as soon as a few hours after operation, and as long as ten years after inoculation. The outstanding clinical features of this infection are a rise in temperature and pulse rate, marked toxemia, edema, and pain in the wound, which presents typical purplish discoloration of the surrounding skin, followed later by coalescing blebs. The diagnostic features are crepitation in the subcutaneous tissues, serosanguineous discharge with a typical sweetish, mousy odor, and smears and cultures positive for the bacillus welchii. Smears may be positive within six hours, and cultures four hours after the onset of infection.

Treatment consists of wide open drainage, and the generous use of oxygenized antiseptic solutions, along with polyvalent perfringens serum. From the cases here presented, it appears quite possible that sulfonamides administered locally and orally are coming to play an important role in the prophylaxis and actual treatment of this type of infection. X-ray therapy has been advocated in the treatment of early cases. In the collected group, 71.4 per cent of the patients recovered, and of this number 73.3 per cent received serum. In the group of 6 patients who succumbed, 2 died before any treatment could be given, and the remaining 4 received serum.

The author presents 2 cases of bacillus-welchii infection following nephrolithotomy for calculi. The first case was a fulminating infection following the removal of multiple calculi, one of which was fragmented. In this case clinical evidence of infection appeared seven hours after operation. In the second case a pyelolithotomy was performed for a single calculus which was not fragmented. This case had been under sulfadiazine treatment before the infection was noted, because of a pulmonary involvement immediately following surgery. The first indication of wound infection occurred forty-eight hours after operation. The course of this case was mild and the infection subsided rapidly following drainage, polyvalent perfringens serum, and sulfonamides administered locally and orally.

In view of the fact that the pyelotomy opening was not sutured after the removal of the calculus, and that the calculus was removed intact, it is extremely likely that the escape of infected urine from the kidney into the wound played an important role in the pathogenesis of this complication.

JOHN A. LOEF, M.D.

Greenblatt, R. B., and Sanderson, E. S.: The Experimental Prophylaxis of Chancroid Disease. *Am. J. Syph.*, 1944, 28: 165.

Investigation of the causative organism of chancroid disease, the bacillus of Ducrey, has been greatly hindered by (1) the lack of satisfactory cultural methods and (2) the lack of susceptibility of the usual laboratory animals to the infection. The factors necessary to growth of the organism are contained in 20 per cent clotted or defibrinated blood agar and in the developing chick embryo, but the X and V factors are not essential. Surface growth of freshly isolated cultures is uncertain, and even with stock cultures is not luxurious. Repeated attempts to reproduce chancroid infections in laboratory animals failed in every instance. Mature and immature animals, including rats, hamsters, white mice, yellow mice, rabbits, and dogs, were injected subcutaneously, intraperitoneally, intratesticularly, and by inoculation of the scarified skin, with uniform failure. Suspension of the organisms in mucin according to the technique of Miller with subcutaneous,

intraperitoneal, corneal, and intravaginal injections failed to produce the infection. Two rabbits received 19 massive intravenous injections in four months without untoward reaction. Serum from these animals failed to protect human beings from experimentally produced chancroid.

In vitro studies of the effect of sulfapyridine and neoprontosil on the haemophilus of Ducrey revealed no apparent inhibition of growth except for 1 to 10 neoprontosil. When the organisms were cultured on the defibrinated blood of patients who had blood levels of from 2 to 11 mgm. per cent of sulfanilamide or sulfapyridine, there was marked inhibition of growth. However, even after seven days of exposure, subcultures taken from the original sulfonamide-containing cultures grew out normally. In-vitro inhibition of growth was observed with 1 to 10,000 phemerol and zephiran and three arsenicals known as 115, 140, and 32 (derivatives of phenyl arsenoxide). Propylene glycol in 1 to 500 to 1 to 10 dilution showed no inhibition of growth.

Studies on prophylaxis against experimentally produced chancroid were carried out on human beings. One hundredth of 1 cc. of a suspension of the haemophilus of Ducrey was rubbed into a cross hatch of four scratches on the anterior aspect of the thigh for ten seconds with the gloved finger. At least 1 control was reserved for each series. Medication was applied at intervals of one, three, and six hours. One half cubic centimeter of test solution was rubbed in over an area 2 cm. in diameter for one minute, the excess being allowed to remain. The areas were covered with cellophane, and the lesions were observed every two or three days for a period of from seven to fourteen days. The results were recorded as positive if an ulcer, a pustule, or an encrusted lesion appeared, and negative if no lesion developed. An inflammatory and tender zone of erythema was considered doubtfully positive. In previous observations 20 per cent sulfonamide and 33 per cent calomel in sulfonated hydrogenated castor oil and water yielded the best prophylactic results, namely, 73.5 per cent success in 34 attempts. In a second series, prophylaxis was successful in 30 of 33 attempts. In a third series of 70 experiments it was determined that best sulfonamide prophylaxis attended the application of a 20 per cent sulfonamide ointment, and particularly of sulfathiazole, three hours following inoculation (51.4 per cent). Poorest results were found at the six-hour interval (40 per cent). Five per cent sulfonamide ointments were less effective and the one-hour interval provided prophylaxis in only 44.3 per cent. When 20 per cent sulfathiazole ointment, and 20 per cent sulfathiazole-33 per cent calomel ointment were compared in a series of 26 patients, it was found that the latter was decidedly more effective. By the addition of 33 per cent of calomel the effective prophylaxis was raised from 42.3 per cent to 80.0 per cent.

Several arsenical compounds, 3-A and 4289-SC, were found to be totally ineffective in the 1 to 100 dilution and, except for 3-A, in the 1 to 400 dilution. Two per cent zephiran gave effective prophylaxis at one and three-hour intervals in 91.1 per cent of forty-five attempts. Ceepyrn and propylene glycol were not effective.

The inoculation of human beings with a virulent strain of the haemophilus of Ducrey gave rise to pustular lesions in from forty-eight to seventy-two hours, which, in a few days, underwent rupture and ulceration, and left a typical chancroidal ulcer. Smears of the pus revealed from a few to many streptobacilli either in the cells or in "schools of fish" out of the cells. The lesion rarely exceeded 1 to 1.5 cm., and healing took place in all instances following sulfonamide therapy (oral and/or local), usually within seven to fourteen days. The presence or absence of a positive Ito skin test to Ducrey vaccine did not seem to influence the course of the experimentally induced chancroid. Positive skin tests in those who were negative prior to inoculation developed, on the average, between fourteen and twenty-one days after inoculation with the haemophilus of Ducrey Bacteriaceae.

DONALD F. MCDONALD, M.D.

Cohn, A., and Kornblith, B. A.: Sulfonamide-Resistant Gonorrhea in the Male. *Am. J. Syph.*, 1944, 28: 179.

It is pointed out that from 15 to 20 per cent of the patients with gonorrhea who have been treated with sulfonamides are resistant to one or even more courses of treatment. This resistance to therapy is shown either by a persistence of symptoms or by a reappearance of infection. The authors express the opinion that the increase in percentage of resistant cases is due to the added period of infectiousness of resistant cases; hence, a vicious circle is established and the problem resolves itself to the establishment of specific therapy of resistant cases. Fever therapy plus chemotherapy is the present means of treatment of resistant cases, but its application is limited both economically and medically by concomitant conditions, such as pregnancy, and by systemic diseases, such as nephritis, and cardiac disorders. Therefore, a less complex and less dangerous means of therapy is desirable.

Sulfonamide-resistant gonorrhea seems to be dependent on two possible factors: (1) primarily resistant gonococcus strains, and (2) a host factor or defense failure by the body.

The authors offer a preliminary report on 22 cases in which sulfonamide therapy was combined with vaccination. Every one of the patients were resistant to sulfonamide therapy. There were 3 with an anterior urethritis, 5 with an anteroposterior urethritis, and 14 with urethritis and prostatitis. The average duration of the infection varied from four to twelve weeks.

The vaccine was heat-killed and was composed of two strains of gonococci: resistant and susceptible. The vaccine therapy was based on the following dosage and increments: 0.01 cc. (4 by 10^6 organisms) was given intradermally, and if the reaction was not

violent in one or two days the quantity was doubled and administered subcutaneously. The dosage, provided it failed to cause a violent reaction, was increased in increments of 0.02 cc. until the tenth injection (amounting to 0.18 cc.), or a total vaccine volume of 0.62 cc., had been given. In most instances the vaccine did not produce violent reactions, but occasionally the injection was followed with severe local and systemic reactions. Sulfathiazole was administered, starting at the time of the fifth vaccination.

The 8 cases of urethritis were cured with this combined therapy. The average period for the reversal of smears and cultures was ten days, and the average period of therapy, fifteen days. The follow-up after the termination of therapy varied from nine to fifty-one days.

The 14 cases of prostatic involvement responded as follows:

Four cases responded promptly.

Four cases responded but relapsed in a period of a week; the patients, however, admitted exposure during this interval. Three of these cases responded to a second course of vaccine-sulfathiazole therapy, and the fourth patient was delinquent.

One case became clinically and culturally negative after being subjected to three courses of the combined therapy.

The remaining 5 cases which suffered severe prostatic complications did not respond to repeated courses of combined therapy. These cases are still being studied by the authors.

ROBERT LICH, JR., M.D.

Cohn, A., and Seijo, I. H.: The In-Vitro Effect of Penicillin on Sulfonamide-Resistant and Sulfonamide-Susceptible Strains of Gonococci. *J. Am. M. Ass.*, 1944, 124: 1125.

Penicillin was added to the blood to be examined so that 10,000 cc. of blood contained 0.176 Oxford units per cubic centimeter. The various penicillin dilutions were: 1:10,000, 1:100,000, 1:200,000, 1:500,000, and 1:1,000,000. In each experiment two or three dilutions of penicillin were tested along with the control blood which was penicillin free. A total of 259 tests were made; 55 sulfonamide-resistant gonococcal strains were used and 132 tests were carried out on 27 sulfonamide-susceptible strains. It was shown that in a penicillin dilution of 1:10,000 all gonococcal strains were killed. As the penicillin dilution was increased the nonresistant strains were more readily inhibited than were the sulfonamide-resistant strains.

"Subtherapeutic" doses of penicillin and sulfathiazole added to the culture media of 11 sulfonamide-resistant strains did not affect their growth. In instances in which penicillin was added twenty-four hours following inoculation to both sulfonamide-resistant and nonresistant strains the inhibitory power of the drug was found to be reduced from 15 to 20 per cent. When para-amino benzoic acid was added to the culture media along with penicillin there was no consistent effect on the gonococcal growth. Furthermore, the antibacterial power of penicillin stored at icebox temperature for four weeks was found to be unaffected.

ROBERT LICH, JR., M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Caldwell, G. A.: Spondylolisthesis. *Ann. Surg.*, 1944, 119: 485.

The absence of symptoms in many cases of spondylolisthesis, regardless of the extent of displacement, makes evaluation of treatment difficult. This study is based upon 59 cases which represent 0.3 per cent of all admissions.

One of 10 patients with low-back complaints severe enough to require medical attention is liable to have spondylolysis or spondylolisthesis, and 1 of 5 of those referred to orthopedic surgery, after other conditions have been ruled out, has neural arch defects. Thus, spondylolisthesis represents one of the commonest causes of low back pain seen by the orthopedic surgeon.

Symptoms and signs similar to other low back lesions can be differentiated from spondylolisthesis only by roentgenographic examination.

Physical examination may be almost completely negative or may reveal a definite apparent deformity with serious limitation of motion, muscular spasm, and disability. Although the lumbar lordosis is often exaggerated, in some cases the back is perfectly flat.

Typical shortening of the back, increased prominence of the buttocks and iliac crest, and an abrupt stepping-off of the spine at the level of the spinous process of the fifth lumbar vertebra is present only in those cases with third and fourth-degree spondylolisthesis.

Tenderness is usually sharply localized to the spinous process of the fifth lumbar vertebra (or the fourth, when this is the level of the lesion), with less tenderness in the lumbosacral angle on either side.

Fig. 1. Technique used in making 35-degree anteroposterior view. (Courtesy of J. B. Lippincott Co.)

Roentgenological examination should include a minimum of three views. A direct anteroposterior, a true lateral view focused on the fifth lumbar vertebra, and a 35-degree anteroposterior view, with the rays directed toward the head and centered between the sacrum and the fifth lumbar vertebra. Unilateral neural arch defects may require confirmation by 45-degree oblique lateral films, but these are not essential for routine examination, although they confirm the findings and visualize them better.

Most investigators have attributed the symptoms of spondylolisthesis to progressive displacement with consequent drag upon the supporting muscles and ligaments, and the nerve roots in the vicinity. This assumption appears plausible since all degrees of displacement are observed and in many cases the symptoms date from trauma which might increase the stretch and strain, or actual displacement of the spinal column on the subjacent sacrum or vertebra.

Slipping probably seldom occurs in adult life, and the exact age at which the major displacement takes place has not yet been established. Slipping and further displacement probably do not cause the symptoms of which the patient complains. The progressive narrowing of the intervertebral disc with degenerative changes in the disc and proliferative changes of the bone in the neighborhood of the intervertebral foramen may readily explain all of the symptoms and signs generally seen in spondylolisthesis.

Results of conservative treatment as reported by various authors are admittedly poorer than the best results obtained by operative fusions; nevertheless, when well directed conservative measures have been carried out consistently, the degree of improvement has been considerable. Furthermore, it seems probable that even better results could be obtained if surgeons themselves gave more thought and attention to planning and directing such measures.

Approximately 80 per cent of the cases were materially improved by the conservative treatment. In only 1 or 2 did the patient carry out weight-reducing regimens with postural exercises and physical therapy, but in these cases the results were excellent and the patients were able to do active work including a moderate amount of bending and lifting without wearing a support. Men doing heavy labor usually found it necessary to change to a lighter occupation, which they were able to perform without wearing a support most of the time.

It is noted that in all the series of surgical cases reported some patients failed to obtain complete relief despite roentgenological evidence of solid fusion postoperatively. On the other hand, failure of fusion occurred in from 20 to 25 per cent of the cases, and among these, some of the patients were completely relieved of symptoms even though the operative procedure was a failure.

In the author's series spinal fusion was performed upon 8 patients. They were observed from ten to twenty-three months; in 3 the results were good and in 1 patient a fair result was obtained; however, in 4 patients, fusion failed to occur and the results were indifferent. Those who obtained poor results are wearing a support, corset or brace, part of the time which enables them to perform light work.

Meyerding believes that in cases of sciatic pain and spondylolisthesis, it is best to combine removal of the protruded disc with lumbosacral fusion. In the author's series there was 1 case, which suggested that associated sciatic pain may arise from another cause, viz., involvement of the nerve root in proliferated bone.

This review suggests the following considerations for speculation:

1. Low-back symptoms observed in patients with spondylolysis or spondylolisthesis are probably due to narrowing of the intervertebral disc and arthritic changes in the lumbosacral articulation, rather than to progressive displacement of the spinal column with consequent drag upon the supporting ligaments.

2. Symptoms produced by lumbosacral arthritis, especially in middle-aged persons not engaged in heavy laboring occupations can usually be adequately relieved by braces, corsets, physical therapy, and postural exercises.

3. Younger patients with similar symptoms producing greater disability may require operative treatment, but it probably would be sufficient to fuse the lumbosacral articulation alone instead of attempting to bridge from the third lumbar vertebra to the sacrum with a bone graft.

4. When sciatic pain is associated with spondylolisthesis, the nerve root should be explored and decompressed, either by its liberation from bony incarceration or by removal of a protruded intervertebral disc.

5. It seems possible, from a theoretical viewpoint, that in certain cases the symptoms might best be relieved by removal of the attached neural arch and the inferior articular processes. Liberation of the nerve roots without fusion of the articulation or bridging of the defect with a bone graft should, of course, be supplemented by postural exercises and low back supports. ROBERT P. MONTGOMERY, M.D.

Senturia, H. R., and Senturia, B. D.: Congenital Absence of the Patellae Associated with Arthrodysplasia of the Elbows and Dystrophy of the Nails: A Hereditary Syndrome. *Am. J. Roentg.*, 1944, 51: 352.

An inherited congenital developmental defect involving the ectodermal and mesodermal layers of the embryo is described. The malformations affect, with striking consistency, the patellae, the nails of the hands (particularly of the thumbs), and the elbow joints. This triad of malformations is transmitted as a hereditary, dominant character and is not sex-linked. A case is described showing the typical clinical and roentgenological appearance. In the patient's family a total of 30 persons in four generations were thus similarly affected.

ROBERT P. MONTGOMERY, M.D.

Kelly, M.: Periarticular Fibrositis of the Knee and the Value of Local Analgesia. *Med. J. Australia*, 1944, 1: 286.

Swelling and pain in the knee is a very common occurrence in the army because of the added strain imposed on the lower extremities by military training. In those cases in which pain, swelling, and decreased function in the knee joints were not due to mechanical derangement, tuberculosis, rheumatoid arthritis, or any other well defined disease, a diagnosis of periarticular fibrositis or panniculitis was made. The treatment, consisting of novocain injections into the tender spots, met with success in more than half of the 46 cases under observation.

Periarticular fibrositis has been repeatedly described since 1938 as a painful thickening of the periarticular structures. The pathological course is divided into three stages: (1) low-grade inflammation, (2) local thickening, and (3) fibrous contractures or capsular thickening.

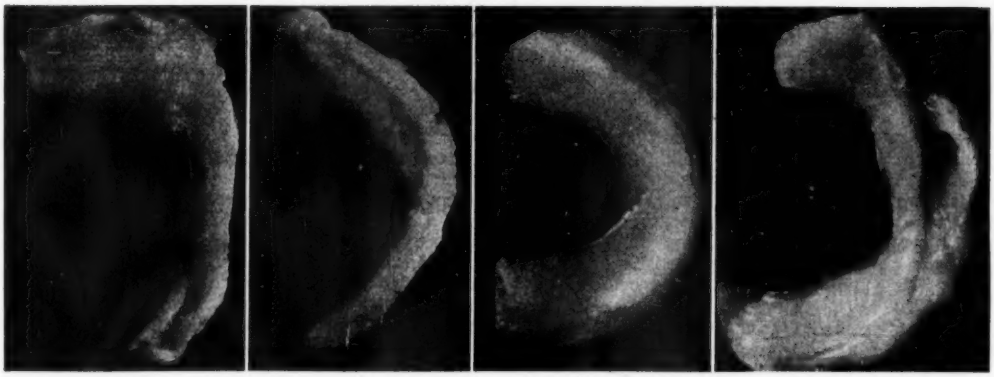
At the beginning pain is elusive, becoming more and more localized and persistent in character. It may be aggravated by weight bearing or it may be worse at night. The often associated swelling is brought about by reflex vascular reaction with escape of fluid into the surrounding tissues due to pain and tenderness in the same area. Because of laxity of the subcutaneous tissue surrounding the knee joint, pitting edema is often observed.

It is important to infiltrate with novocain, not only the tender points in the immediate vicinity of the joint, but also the tender areas in the musculature. If this is not done, pain usually recurs quite readily and aggravates the condition. By far the most common site of the secondary tenderness is the inner femoral condyle, termed by the author as the "adductor tubercle spot." Many other areas of localized tenderness can be discovered, sometimes as high as the midthigh region.

Short case histories and methods of treatment of 9 cases are presented. Several cases are included which were under suspicion of being hysterical joints or fractures of the internal semilunar cartilage. In this connection it is pointed out that in army surgery in England, the diagnosis of fractured internal semilunar cartilage could not be confirmed at operation in many cases. GEORGE I. REISS, M.D.

Smillie, I. S.: Observation on the Regeneration of the Semilunar Cartilages in Man. *Brit. J. Surg.*, 1944, 31: 398.

There are 7 recorded cases in the literature of proved regeneration of a meniscus in man to show that the behavior of the knee joint is similar in man in every respect to that repeatedly observed after extirpation of a meniscus in animals, in which it is invariably found that a new structure grows which resembles the normal cartilage in shape and appear-



a b c d

Fig. 1. a, Normal medial meniscus; b, regenerated medial meniscus. There is a bucket-handle tear of the posterior horn which does not completely penetrate the substance of the meniscus. c, Normal lateral meniscus; d, regenerated lateral meniscus. There is a lesion of the peripheral attachment of the meniscus which has caused the middle portion to be displaced toward the center of the joint.

ance, but it is composed entirely of fibrous tissue. In a series of 600 meniscectomies in man, reports of, and comments on, 5 cases in which a regenerated meniscus had been torn, are made.

One case in this series was subjected to arthrotomy six weeks after the original operation. After this short interval the anterior horn was found to be completely reconstituted.

When the entire meniscus is excised, a new one grows in from the parietal synovial membrane, and it has much the same form and general appearance as the normal structure. The characteristic features which distinguish the normal medial from the normal lateral meniscus are reproduced, and illustrate the relatively broad posterior horn of the regenerated lateral meniscus.

In spite of the evident gross similarity, detailed examination reveals features which permit the recognition of a regenerated meniscus:

1. The attachment to the capsule is very dense and narrow and there is no obvious line of cleavage such as normally exists between the capsule and meniscus.

2. The new meniscus is thinner and narrower than normal. Thus, the cross-section is approximately equilateral, in contrast with the acute-angled triangular section of the normal meniscus; that is to say, the concave margin of the regenerated meniscus projects less toward the center of the joint.

Both these points, i.e., density of attachment and narrowness in comparison with the normal, have important clinical implications.

3. The fibrous tissue of which the new meniscus is composed has a glistening surface which is much whiter than that of normal fibrocartilage. The concave edge lacks the sharp definition of the normal meniscus and is thin, wavy, and almost transparent.

4. Histological examination reveals fibrous tissue only; there are no cartilage cells.

The difference in the microscopical features is most marked in comparing a section of regenerated meniscus of recent origin, which is composed of young fibrous tissue, with a section of normal fibrocartilage. The difference is less when the section examined consists of mature fibrous tissue from a regenerated meniscus of long standing, except that there are no cartilage cells.

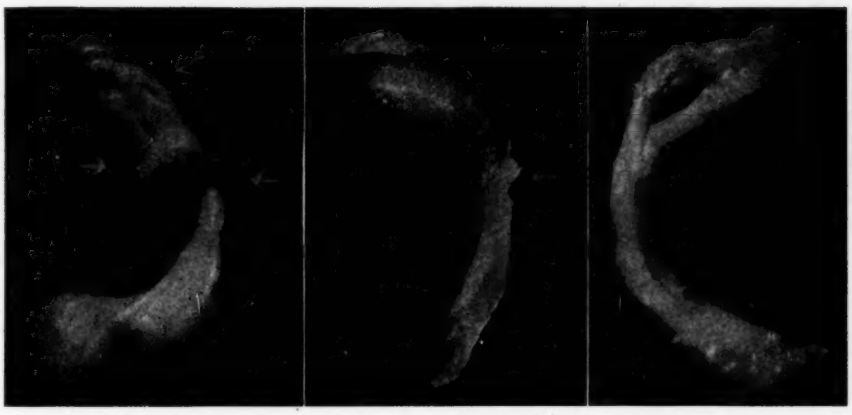
In those cases in which the surgeon had failed to remove the posterior third or even half of the meniscus it was found that:

1. The excised portion had been replaced by an ingrowth of fibrous tissue with the same characteristics as those noted in reconstitution of the complete meniscus.

2. The regenerated anterior horn is joined only to the peripheral zone of the original posterior horn, i.e., the zone supplied with blood vessels. The appearance of the junction therefore depends on whether the original meniscus was divided transversely or obliquely. If it had been divided transversely the concave aspect of the stump of the original posterior horn projects toward the center of the joint; if it had been divided obliquely the junction is more uniform.

These observations afford evidence in favor of total rather than partial meniscectomy, no matter what lesion is encountered, for if it be accepted that the meniscus performs a function, that function can best be performed by the most perfect replica of the original. The most perfect replica possible follows total meniscectomy.

The rarity of lesions of regenerated menisci is explained by the differences in attachment and cross-section compared with the normal. The density of the attachment to the capsule reduces the mobility and the small transverse section, and decreases projection toward the center of the joint which makes the liability to injury in an otherwise sound joint



a b c

Fig. 2. a, Regenerated anterior horn and original posterior horn. The arrows, reading from left to right, refer to: (1) tag of original posterior horn protruding toward the center of joint; (2) bucket-handle tear; and (3) junction of regenerated with original meniscus. The difference in width and color is clearly seen. b, Regenerated anterior horn and original posterior horn. The arrow indicates the junction. The difference in color is clearly seen. c, Regenerated medial meniscus with bucket-handle tear of the posterior horn.

extremely unlikely. The phrase "otherwise sound" requires elaboration. In 3 of 5 cases of lesions of regenerated menisci it was found that the anterior cruciate ligament was divided, and in the remaining 2 the anterior cruciate ligament, the collateral ligaments, and the capsule were extremely lax. It seems, therefore, that injury to a regenerated meniscus is possible only in the presence of factors producing gross instability of the knee joint.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Baker, L. D., Schaubel, H. J., and Kuhn, H. H.: Open Versus Closed Treatment of Acute Osteomyelitis. A Clinical Report on the Use of Antitoxin and the Sulfonamide Drugs with and without Early Drainage. *J. Bone Surg.*, 1944, 25: 345.

Hematogenous osteomyelitis is part of a systemic disease. In combating an infectious disease, destruction of the invading organism and repair of damaged tissue is important. In the treatment of staphylococcus infection, the neutralization of exotoxins is of great importance. There are four effects of staphylococcus exotoxin or exotoxins which make this disease so difficult to treat. These are indicated as follows:

1. The destruction of leucocytes and the consequent appearance of immature white blood cells in the circulating blood
2. The hemolysis of red blood cells with ensuing anemia
3. The necrosis of tissue causing a breakdown of bone and soft tissue
4. The coagulation of plasma giving rise to thrombosis of the capillary beds; infected emboli may be discharged and cause metastatic lesions.

The general effects caused by the exotoxins are fever, elevated pulse rate, nausea, vomiting with dehydration and acidosis, avitaminosis, and a possible fatal outcome. For clinical purposes, the appearance and amount of immature juvenile stab cells is a satisfactory guide for the degree of toxemia. Purified Burky's Ha strain of hemolytic staphylococcus-aureus antitoxin has been found to be a satisfactory adjunct in the patient's treatment.

For three years, 56 patients with hematogenous staphylococcus-aureus osteomyelitis were treated according to standard standing orders with sulfanilamide or sulfathiazole. These drugs can be replaced by any other effective bacteriostatic agent; for instance, penicillin. Thirty patients had incision and drainage of the local lesion, and 26 had no local drainage except for aspiration. When last seen, 21 of the 30 patients who had local incision and drainage had a draining sinus. Of the 26 patients treated without incision and drainage, 21 never had a draining sinus. Spontaneous drainage had developed in 4.

The routine therapy for osteomyelitic patients consisted in:

1. Complete examination, with roentgenograms of the affected parts and of the chest
2. Hemoglobin determination, red blood cell and white blood cell counts with differential; hemoglobin and differential counts repeated daily for the first week and every other day during the acute stage of the disease
3. Adequate doses of staphylococcus antitoxin
4. Administration of sulfathiazole or sulfadiazine, according to the dosage chart

5. A daily urine examination for the first week and every other day as long as sulfonamides are given
6. Intravenous fluids as needed
7. Transfusions of from 150 to 200 cc. given daily as indicated
8. Determination of the staphylococcus titer on admission and after transfusion from a new donor
9. Blood cultures on admission and daily thereafter until they are negative for three successive days
10. Sedatives as indicated
11. Violet-ray therapy to be given daily
12. Immobilization of the affected part in the best position of function, with traction, splints, or casts
13. Normal saline compresses to involved areas
14. Aspiration with culture of abscesses on admission. (Following aspiration, the abscess cavity is to be irrigated with normal saline solutions until the washings are cleared. One or two grams of microcrystal solution of sulfathiazole solution is instilled and then completely reaspirated. This procedure is to be repeated as indicated.)
15. A high vitamin diet
16. Administration of ascorbic acid, 50 mgm. three times a day; of nicotinic acid, 25 mgm. twice a day; of thiamine chloride, 5 mgm. three times a day; and of oleum percomorphum, 10 drops twice a day.

In the discussion, WHITE did not advocate rigid immobilization to prevent bone and soft-tissue atrophy. His experience with penicillin and therapy without local incision and drainage has been very satisfactory, and he thinks that penicillin seems to work more quickly than the sulfonamides.

GEORGE I. REISS, M.D.

Kirk, N. T., and McKeever, F. M.: The Guillotine Amputation. *J. Am. M. Ass.*, 1944, 124: 1027.

Closed amputations are dangerous to life and wasteful of stump length in the presence of established infection or potentially infected extremities.

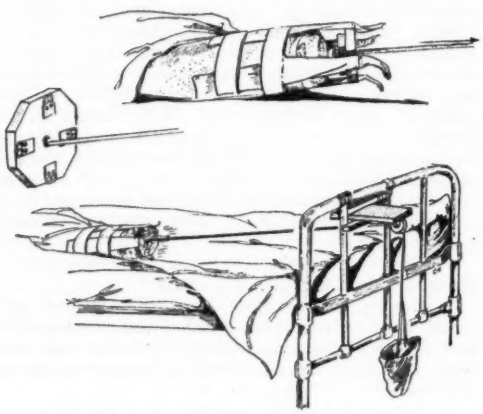


Fig. 1. Diagram of method of applying traction to open stump ("Amputations," by N. T. Kirk).

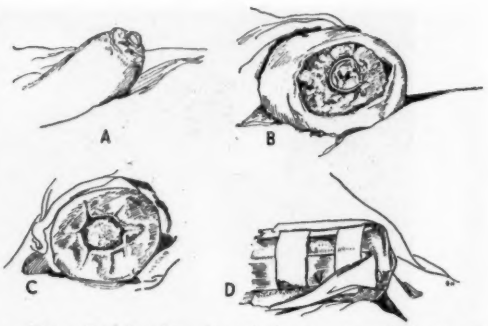


Fig. 2. Results of traction: A, B, stump on admission; C, sixteen days with traction; D, traction straps turned back; skin approaching end of bone ("Amputations," by N. T. Kirk).

The local and systemic use of sulfonamide drugs has not obviated the dangers from closed amputations in the presence of infections. The sulfonamides have a definite place in secondary closures and should be used both systemically and locally. Since there is no sloughing muscle or open fascial planes when the secondary closure is carried out, these drugs have less unfavorable factors to overcome and are more effective. Their use permits earlier closure under these circumstances than was possible prior to their advent.

The open or guillotine amputation is definitely indicated if the possibility of infection is present. Its use in the presence of infection will save life and also useful stump length. If there is an abundance of stump, a reamputation at the site of optimum function with primary closure can be carried out without danger of relighting infection. For example, if the stump is above the ankle the reamputation can be carried out at the site of election in the middle third of the leg, or if a portion of the foot remains a Symes' amputation can be performed and closed by primary suture.

The proper after-care of the guillotine amputation is an essential for good results. Continuous skin traction from the time of amputation is imperative if good results are to be obtained. Otherwise, reamputations with resultant loss of bone length will occur. Skin traction may also be used advantageously after the plastic closure and be employed until healing results if there is any evidence of tension. This technique enables closure to be effected without additional sacrifice of length when there is no abundance of stump.

Skin grafts, even of the pedicle type, are of little value in effecting closure of the open amputation stump. Because of the avascularity of the stump end, the pedicle is usually lost. If successfully attached, the imperfect sensation and small vascular margin of safety of the flap will not tolerate the trauma of wearing a prosthesis.

ROBERT P. MONTGOMERY, M.D.

Thompson, T. C.: Temporary Prostheses. *J. Am. M. Ass.*, 1944, 124: 1041.

Well healed satisfactory stumps should be obtained as soon as possible after amputation.

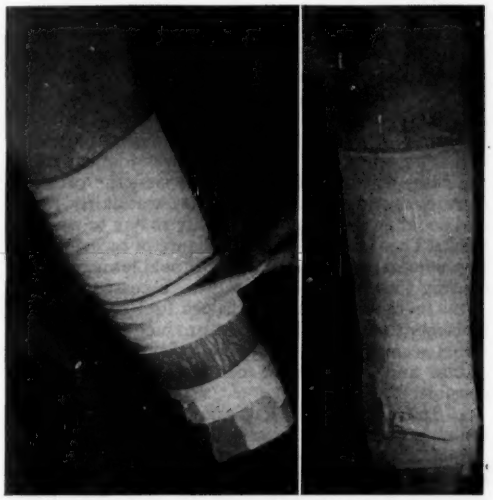


Fig. 1. a, left, Applying stockinet and cardboard for building pylon; b, plastic applied, forming socket for pylon.

Temporary prostheses are most important in toughening up the stumps and preparing them for permanent legs.

The adjustable fiber prostheses which are ordered at the time of amputation are shown in Figure 5. They are strong, durable, and inexpensive. The removable leather buckets can be made and the entire leg fitted and adjusted as necessary by any well trained brace maker, preferably one with some experience in artificial legs. These prostheses function practically as well as high-priced willow or aluminum legs. ROBERT P. MONTGOMERY, M.D.

Thomas, A.: The Permanent Prosthesis. *J. Am. M. Ass.*, 1944, 124: 1044.

It should be emphasized that in the successful fitting and use of prostheses not too much importance should be placed on the particular type of limb and materials used, or certain special features, such as complex joint controls. The more important considerations from the point of view of both the patient and surgeon are whether the socket properly fits the stump and whether the limb is well constructed and of proper alignment and length.

Success in the rehabilitation of a person crippled by the loss of a limb depends first on a well performed amputation with a stump of proper contour and length, and, finally, on the closest co-operation between the surgeon and a skilled, ethical limb maker in the selection and fitting of the permanent prosthesis. ROBERT P. MONTGOMERY, M.D.

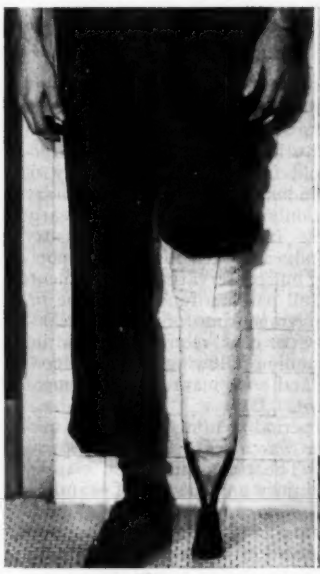


Fig. 2.

Fig. 3.

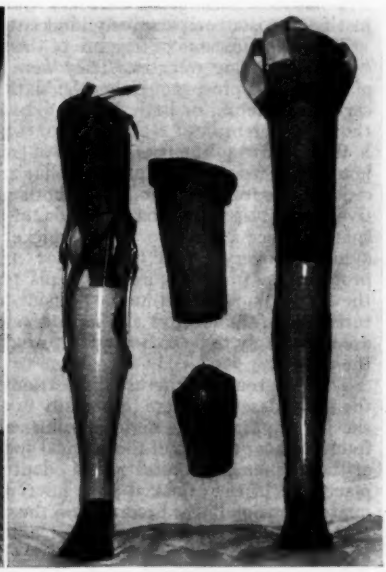


Fig. 4.

Fig. 2. Plaster socket incorporated into walking iron with crutch tip.

Fig. 3. Temporary pylon for short thigh stump.

Fig. 4. Adjustable fiber prostheses with molded leather sockets for leg and thigh stumps.

FRACTURES AND DISLOCATIONS

Crooks, F., and Birkett, A. N.: Fractures and Dislocations of the Cervical Spine. *Brit. J. Surg.*, 1944, 31: 252.

A study of 59 cases is the basis for the following report.

The authors review a series of cases of fracture of the cervical spine and report some facts concerning the incidence of this condition in fracture clinics in hospitals in an industrial area. Analysis is made with regard to the type of injury, the influence of age, and the frequency of fracture and displacement at the different levels of the neck. Certain features which were noted in the investigation are emphasized as follows:

1. The occurrence of isolated spinous-process fractures is found to be related to fracture-dislocation of the neck, or to be due to muscular or direct violence on the spinous process itself. The type due to violence on the process itself has been described adequately under the name of "clay-shoveller's fractures" by McKellar Hall (1940). The two types of fracture should be differentiated from one another, and if the type of violence causing the accident is that which would likely have given rise to fracture-dislocation of the spine, then fracture of a spinous process must be regarded as evidence that some degree of fracture-dislocation has occurred, and such a case should be regarded with suspicion and treated with the respect given to fracture-dislocations. The clay-shoveller's type of fracture is a separate entity and has not been given as much publicity as is justified; it is a comparatively innocent lesion.

There were 6 cases of fracture of the spinous process alone among 59 cases. They were all fractures of the spinous process of either the sixth or seventh cervical vertebra, or both, associated with the first thoracic vertebra.

With regard to the possible lines of treatment it is noted that fixation in a plaster collar and early excision of the fractured process are both equally effective, but it is clear that excision of an isolated spinous-process fracture is the quicker method of aiding recovery, while, if two or more spinous processes are fractured, fixation in plaster is possibly the better line of treatment. Spinous-process fractures above the level of the sixth cervical vertebra are more likely to be part of a fracture-dislocation of the neck.

2. The group of fracture-dislocations comprising the series described were principally in the upper or the lower part of the cervical spine, and of those fractures near the top of the cervical spine, fractures of the atlas and fractures of the odontoid, and displacement of the atloaxial joint have received adequate attention in the literature on the subject. The authors think that the effect of the specialized anatomy of the axis and the result of violence upon it have been insufficiently realized. Some reference to this was made by Capener in an article on spondylolisthesis (1932). The authors believe that this lesion is one of importance because among the 52 cases of fracture-dislocation of the cervical spine there were 6 at this level and the only real lamina fractures occurred in the axis and comprised 4 of the 6 cases.

It is seen also that injuries to atlas, axis, and odontoid process have a comparatively low mortality and the proportion of deaths and paraplegia rises steadily as the injuries are followed down to the seventh cervical vertebra. Temporary paraplegia may occur and results in complete recovery. Incomplete paraplegia may lead to a good recovery, and from clinical observations it was found that in the cases which made good recoveries, the progress of recovery from the nerve injury was fairly rapid and could be seen almost from day to day or week to week. There seemed to be no chance of recovery if it was not early and rapid. The probable mechanism causing this type of fracture was discussed.

3. In cases of fracture-dislocation, complete replacement is not necessary to produce a good functional recovery, but every effort should be made to obtain and maintain as complete a reduction as possible.

4. In fracture of the lower part of the cervical column, emphasis has been laid on the part which chronic arthritis may play, and the importance of it has been stressed because it appears that there is a special liability to injury of the cord with some chronic arthritic stiffening of the neck in older people who fall heavily. Emphasis has been laid also on the point that in these cases one may be unable to find roentgenological evidence of displacement although the patient may be suffering from complete paraplegia. ROBERT P. MONTGOMERY, M.D.

Henry, M. G.: Fractures of the Carpal Scaphoid Bone in Industry and in the Military Service. *Arch. Surg.*, 1944, 48: 278.

In this report the author submits 12 cases of fractured carpal scaphoid from a five-year survey of work done in a large industrial plant. In the military service his survey of only four months shows nearly twice as many cases. In the 12 cases in industry over a five-year period, each patient recovered completely with exacting but conservative management. Each one regained full painless function of the injured wrist in an average time of twelve weeks. Three patients, or 25 per cent, required surgical intervention, 2 for nonunion following prolonged conservative treatment and 1 for marked displacement of the lateral fragment.

In a four-months period at a large receiving and embarkation base he was able to find 22 cases of fractured scaphoid. The time which had elapsed between the time of injury and the day of examination ranged from one day to three years. Seventy-three per cent of the patients suffered from fracture through the middle third of the bone, while 22 per cent had fractures of the outer third, and only 5 per cent of the inner third. All of these patients had pain in the wrist, especially on hyperextension of the

hand, and all had weakness in gripping. There were 7 cases of definite nonunion.

An analysis of the cases convinced the author that no one set of rules can ever be ideal for this industrial as well as military problem. Each fractured scaphoid must be treated as an individual problem if satisfactory results are to be obtained. It is believed that the end-result does not depend on immobilization, rest, or any other conservative treatment, but rather on the site of the injury and whether or not this injury has destroyed or impaired the already poor circulation to the scaphoid bone. It has been the author's policy to operate as early as possible after the diagnosis is made, if operation is to be done, because he thinks that this gives the best ultimate functional result.

A review of the literature is given. Fractures of the carpal scaphoid are the most frequently missed of all injuries to the wrist and therefore are the most neglected. All sprains of the wrist not showing progress within a week should be examined roentgenographically. When roentgenograms are taken the hand should be in extreme ulnar deviation at the wrist joint. Fracture through the middle to inner third of the scaphoid with any degree of displacement should always be treated by complete excision, after swelling of the wrist has subsided. When the fracture of this bone is a mere line and the fragments of bone are in good apposition, with no displacement and little, if any, comminution, the treatment is conservative, consisting of immobilization, diathermy, whirlpool baths, and passive and active movement. When the scaphoid bone is seriously comminuted, early surgical treatment is advised. All the affected parts should be excised. Any dislocation of the scaphoid should be treated by total excision of the bone. Any crushing of the scaphoid should be treated by complete removal of the bone. In a five-year industrial survey the author found an incidence of 25 per cent of nonunion in fractured scaphoids, while in a large military base with more cases the incidence was 32 per cent.

EMIL C. ROBITSHEK, M.D.

West, E. F.: The Treatment of Compound Fractures of the Femur in Battle Casualties at a General Hospital. *Med. J. Australia*, 1944, 1: 193.

The following three methods of treatment of compound fractures of the femur are advocated: (1) slinging of the injured limb in a Thomas splint, with knee-flexion piece attached, and with extension applied by means of skeletal traction by weights; (2) immobilization of the injured limb in an ordinary Thomas bed knee splint, with fixed extension by adhesive strapping applied to the skin; (3) immobilization of the injured limb in a single or double plaster-of-Paris spica of the hip.

In this series the first method was most frequently used and was found to be the most comfortable. It also offered the greatest facilities for nursing the patient, and in the treatment of compound fractures of the femur the nursing is of paramount importance.

A Steinmann pin is preferred to Kirschner wire. The Steinmann pin should be a fine one, about 3 mm. in diameter. The stirrup should be of the Boehler pattern, with revolving collars on each side holding a set screw which grips the pin. These allow the stirrup to rotate without rotating the pin in the bone.

The pin is inserted through the tibial tubercle about 2 cm. distal to the upper articular surface of the tibia, where it can be driven easily through cancellous bone. If it is inserted further down the shaft, the insertion is more difficult.

The second method is advocated in the following circumstances: (a) when there are wounds at the site where the Steinmann pin would have to be inserted, that is, at the upper end of the tibia; and (b) in some transverse types of fracture, which are more easily controlled by fixed extension. In these cases a slight degree of overextension (distraction) for the first day or two allows better apposition to be obtained by adjustment of the slings, and then the extension is slackened to allow locking of the fragments.

The third method is advocated in the following circumstances: (a) when considerable loss of bone from the femoral shaft has occurred; in these cases the limb must be allowed to shorten so that the fragments are in contact in order to obtain union, and the spica then is the only way to obtain this result; and (b) in the later part of the treatment, when the hip joint is involved and ankylosis is inevitable, in order to obtain sound ankylosis in the optimum position.

Detailed descriptions of the three methods of treatment are presented with cautionary remarks.

Shortening of ½ in. is of no importance so long as union is obtained and sepsis is controlled. The secret of success is to obtain satisfactory (not necessarily anatomical) position and alignment in the beginning and then leave the fracture alone. Too much interference in all fracture work is fatal.

Two things are necessary in the treatment of wounds and compound fractures: drainage and rest. When this is realized, compound fractures will cease to be a problem. ROBERT P. MONTGOMERY, M.D.

Joldersma, R. D., and Macpherson, F. L.: Fracture of the Tibia and Fibula Treated by T and G Bone Plate. *Am. J. Surg.*, 1944, 63: 352.

Since the article entitled "Fallacies of Bone Plating" was written by the authors in 1943, the results of a year's use of the T and G bone plate are reviewed, and 2 errors in its application which have shown up are described.

The plate must not be held against the bone with a clamp or bone forceps when it is applied, as the pressure may bend down the side walls and weaken its structural strength.

All the screw slots in the plate, especially those over the fracture site, must be occupied by screws. The plate is, of course, weaker at the site of the screw slot and must be sustained bp a screw to get maximum strength. This is done by putting in a screw at an angle through the line of fracture.

The authors wish to emphasize that plating must be done within five hours, or the case should be splinted temporarily and not be plated for two weeks. There must be no damage to the skin over the tibial ridge. If in doubt, a splint should be applied temporarily for two weeks.

The skin incision should be a curved one on the lateral side, and the plate should be applied to the lateral aspect so it will be covered by muscle.

Anatomic reduction and opposition of fragments must be obtained, and transverse fractures should be thoroughly impacted before the screws are tightened. A screw running obliquely through the line of fracture is desirable. Every slot in the plate must be supported by a screw.

The authors believe that they have shortened the years of disability by at least 50 per cent with their method of securing perfect alignment and length. Case reports and statistics are cited.

EMIL C. ROBITSHEK, M.D.

ORTHOPEDICS IN GENERAL

Gill, G. G.: The Cause of Discrepancy in Length of the Limbs Following Tuberculosis of the Hip in Children. Arrest of Growth from Premature Central Closure of the Epiphyseal Cartilages about the Knee. *J. Bone Surg.*, 1944, 25: 272.

The author suggests that discrepancy in length of the limbs following tuberculosis of the hip in children is due to growth arrest from premature central closure of the epiphyseal cartilage plates about the knee. These may be the lower femoral plates, the upper tibial, or both.

Fifteen cases of childhood tuberculosis of the hip are presented. All of the patients were below the age of seven years and all were immobilized over a long period of time. In 10 cases both the lower femoral and the upper tibial cartilage plates were involved. In 3 cases the upper tibial cartilage plate alone was involved, and in 2 cases the lower femoral cartilage plate alone was involved. In no case was there abscess formation or evidence of tuberculosis of the knee joint.

The roentgenographic appearance is that of formation of a bony lock between the epiphyses and diaphysis at or near the central portion of the cartilage plates, following which growth arrest takes place. As the cause of this condition, the author suggests that decalcification with changes in the physical structure of the cartilage plate occurs, which makes it more susceptible to trauma and subsequent premature closure.

The author believes that measurement of the extremity should be done every six months and that roentgenographic records of the actual length of each bone should be kept. Vitallium markers should be used in doubtful cases. Correction of the discrepancy is by epiphyseal arrest or bone-lengthening operations.

DANIEL H. LEVINTHAL, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Blalock, A., and Park, E. A.: The Surgical Treatment of Experimental Coarctation (Atresia) of the Aorta. *Ann. Surg.*, 1944, 119: 445.

The authors note that, according to Bramwell and King, a pathological narrowing of the aorta in the region of the isthmus, just beyond the origin of the subclavian artery, and varying from a slight degree to complete occlusion, is found in approximately 1 of every 1,500 autopsies. The mouth of the subclavian artery itself is affected in a small percentage of cases. Involvement of the isthmus itself between the left subclavian artery and the ductus arteriosus is known as the infantile type, while stenosis at or just below the ductus is designated as the adult type.

The chief physical signs consist of evidence of an increase in the collateral arterial circulation and an increase in arterial blood pressure in the arms and a decrease in the legs.

The authors note that since coarctation of the aorta may result in untoward incidents, such as cerebral accidents, it is desirable to find a method to circumvent the stenosis or atresia. It seemed possible that this might be done by performing an anastomosis between one of the large arteries which come off the aorta proximal to the constriction and the side of the aorta distal to the point of stenosis. A total of 43 experiments was performed on dogs. The operative procedures are described. At a one-stage operation the thoracic aorta was divided, the two ends were closed, and the proximal end of the divided left subclavian artery was anastomosed to the side of the aorta beyond the point of its division. Some of the animals survived this procedure and there was evidence of an adequate blood flow to the posterior part of the body.

The predominating postoperative complication was paralysis of the posterior part of the body. Paralysis of varying degree occurred in almost half of the cases. It was usually noted during the first twenty-four hours after operation.

The studies of the authors show that the femoral arterial pressure at the conclusion of the operation does not allow one to predict with any degree of certainty the chances of survival of the animal. The fact that some of the animals survived complete division and closure of the aorta shows that the subclavian artery was effective in conducting blood to the posterior part of the body. In only 5 of 43 experiments was the subclavian artery or the anastomosis blocked by a thrombus.

There would be some obvious objections to the use of the subclavian artery in man if the operative procedure described here were used. The subclavian artery is the most important vessel in supplying blood to collateral pathways around the point of stenosis or atresia of the aorta. Division of this vessel might interfere considerably with this blood supply. Division and rotation of the subclavian artery might interfere too greatly with the circulation of the arm. The left common carotid artery is a better vessel to use. Since many collateral pathways are already existent in the patient with coarctation, it is the impression of the authors that the additional quantity of blood supplied by the carotid artery would be sufficient to improve considerably the circulation of the lower part of the body.

Although this operation has not been attempted in man, it would appear that the enlarged collateral vessels which enter the aorta below the point of the stenosis in the patient with coarctation would make it difficult to obtain a dry field for the performance of the anastomosis. On the other hand, it would appear that the patient with a chronic partial occlusion of the aorta would tolerate a temporary complete occlusion better than the normal dog in which there has been no stimulus to the formation of collateral arterial pathways. This procedure should be considered only in those cases of coarctation in which the outlook is very grave since many patients with coarctation of the aorta have a fairly long life expectancy. HERBERT F. THURSTON, M.D.

Levin, A., and McElroy, D. M.: A Case of Cerebrospinal Fever, with Thrombosis of the Right Axillary Artery, Followed by Gangrene of the Right Arm, Necessitating Amputation. *Brit. J. Surg.*, 1944, 31: 240.

The subject of this case report, a forty-seven-year-old man, was admitted to the hospital with typical clinical and laboratory signs of meningococcic meningitis. Blood culture was positive for meningococci. He was given glucose-saline solution with sodium sulfapyridine directly into the antecubital veins of both arms. On the night of admission he sweated profusely, after which his skin felt cold, and extra warmth was applied. A few hours later it was noted that his right arm was flaccid and colder than the rest of his body. Neither the radial nor brachial pulse was palpable but some pulsation was felt high in the axilla. The skin of the arm was pale, the muscles were firm, and no edema was present. A circulatory disturbance of the right arm was diagnosed but surgical interference was considered inadvisable. The arm was left covered with a thin layer of cotton wool. On the third day a definite line of demarcation was first seen about 2 in. above the elbow joint. Ten days later the arm was amputated to leave approximately 2½ in. of the head and neck of the humerus. The brachial artery and venae comitantes were completely thrombosed up to the middle of the axillary vessels. His spinal fluid became clear and he made a good recovery about three weeks after admission.

It is probable that the occlusion occurred within the first twenty-four to forty-eight hours of illness.

There was no evidence of a heart lesion which might have given rise to an embolism, and microscopic studies of the amputated limb indicated that the occlusion was due to thrombosis. The thrombosis is not easily explained. The intravenous injection was shown to have been directly into the vein and it is not clear how arterial involvement could result from this. McMeans, who discusses the occurrence of arteritis in meningitis, states that disorganization of the intima may occur and produce thrombosis. Murray states that agglutination of human serum may cause the formation of minute meningococcal emboli which plug the smaller peripheral vessels. It is suggested that because of the severity of the blood-stream infection in this case such emboli impaired the blood supply to the larger vessels and resulted in damage to their walls and subsequent thrombosis. JOHN L. LINDQUIST, M.D.

Koffler, A., and Freireich, A. W.: Thrombophlebitis as a Hitherto Unreported Complication of Thiocyanate Therapy of Hypertension. *Am. J. M. Sc.*, 1944, 207: 374.

The authors state that during the past three years they have treated 4 cases of essential hypertension with potassium thiocyanate according to the method of Barker. While the clinical results are reported elsewhere, they wish to report herein on the occurrence of thrombophlebitis as an apparently unpublished complication of the administration of potassium thiocyanate.

The high incidence (4 cases among the 40 patients treated), leads to the belief that the condition is due to a definite toxic effect. The usual toxic effects that have been reported are dermatitis, weakness, dizziness, loss of appetite, and easy fatigability. Venous thromboses in the extremities apparently have never been reported previously.

The clinical findings of 1 of the 4 cases observed by the authors are reported in detail. Summaries of the 3 other cases also are presented. This incidence of thrombophlebitis, amounting to 10 per cent and occurring in the course of therapy of hypertension with thiocyanate, is much greater than can be explained by pure coincidence and must be accepted as a toxic effect which has not been previously reported. It does not appear to be related to the level of thiocyanate in the blood, and may occur early or late in the course of treatment. HERBERT F. THURSTON, M.D.

Yaskin, H. E., and Alpers, B. J.: Aneurysm of the Vertebral Artery: Report of a Case in Which the Aneurysm Simulated a Tumor of the Posterior Fossa. *Arch. Neur. Psychiat.*, Chic., 1944, 51: 271.

Large intracranial aneurysms of the vertebral artery are rare. Such an aneurysm, which produced signs of tumor in the posterior fossa, is reported, and the recorded cases of these aneurysms are tabulated and reviewed. The patient in this case was a man forty-four years of age, whose symptoms had been present four months. He had experienced increasingly severe attacks of left frontal headache, radiating from the left suboccipital region and associated with nausea and vomiting. Because of his confused mental state and the history of an excessive intake of bromoseltzer, an initial diagnosis of bromide intoxication was made. The existence of a neoplasm of the left posterior fossa involving the cerebellar hemisphere, vermis, and medullary centers and pathways on that side was also suspected. The patient's poor condition delayed the consideration of an operative procedure and he died without surgical exploration.

Autopsy revealed a tremendous dilatation of the left vertebral artery which formed a saccular tumor mass. The aneurysm had not ruptured, and the entire lumen contained an antemortem thrombus. An excavation extending into the adjacent basilar portion of the left cerebellar hemisphere and the left side of the vermis had been made by the aneurysm, and the medulla was compressed and displaced to the right. The upper cervical portion of the cord was compressed to a lesser degree. The right vertebral artery was hypoplastic.

Of 72 cases of aneurysm of the vertebral artery found in the literature, 35 were reported with sufficient data to make possible the analysis of the clinical features of this condition. The majority of the cases occurred in males and in the age group of from forty to sixty years. Of the possible etiological factors, arteriosclerosis was the most prevalent condition found in the series and was undoubtedly the chief cause, especially in the older age groups. The most frequent symptom was suboccipital headache and pain, characterized by its episodic nature in most cases. The pain in the neck often radiated and was aggravated by change in position of the head and neck. Vertigo associated with nausea and vomiting was recorded in most of the cases. Paralysis of the fifth to the twelfth cranial nerves was frequent. The clinical picture was dominated by intermittent and long-standing symptoms of vague cerebellomedullary or pontile involvement and gradual compression of the medulla. Examination may lead to a suspicion of tumor of the posterior fossa, in the region of the foramen magnum, or of the high cervical portion of the cord. In cases of unruptured aneurysm there appears to be no specific sign or symptom which differentiates aneurysm of the vertebral artery from tumor.

JOHN L. LINDQUIST, M.D.

Gage, I. M.: The Technical Simplicity of the Matas Endoaneurysmorrhaphy. *Ann. Surg.*, 1944, 119: 468.

The author notes that the operation of endoaneurysmorrhaphy not only entails a thorough knowledge of the technique, but a familiarity with the pathological physiology of aneurysms, both local and systemic, with the absolute control of all bleeding during the operation, the collateral circulation, the methods of testing the collaterals, the procedures used to develop a negligible and sluggish col-

lateral circulation, and the preoperative and postoperative treatment.

Matas divided his endoaneurysmorrhaphy into three types: (1) restorative; (2) reconstructive; and (3) obliterative. The first type is only applicable to the true saccular type of aneurysm. This operation is one in which the lumen of the artery can be restored because there has been no loss of any part of the arterial wall. The reconstructive operation was designed for the fusiform type of aneurysm. The technique consisted of forming a new segment of artery out of the walls of the aneurysmal sac. The obliterative technique is recommended for all forms of arterial aneurysms except the pure saccular type. The obliterative operation consists of opening the aneurysmal sac with intrasaccular closure of all arterial openings and complete obliteration of the sac. Therefore, the obliterative type of endoaneurysmorrhaphy is the procedure of choice in all arterial aneurysms, both traumatic and organic, of the peripheral arteries, with exceptions as noted.

There is a group of arterial aneurysms in which the methods described are not applicable: common-carotid group; subclavian group; aorta group; iliac group; aneurysms of the innominate artery, splenic artery, renal artery, common femoral artery, and gluteal artery; and the intracranial group. The procedure of choice in this group is that of Anel, i. e., proximal polar ligation of the main artery entering into the formation of the aneurysm. In the low carotid, subclavian, and innominate groups, the author recommends the transpleural, transthoracic approach of Touroff.

An adequate and sustained collateral circulation must be present and satisfactorily demonstrated before the operation is undertaken. The collateral circulation can be developed by two methods: mechanical (Matas method); and physiological, blocking out the sympathetics (the author's method). The former is by the daily application of the Matas compressor which obliterates the main artery proximal to the aneurysm. The latter method is accomplished by blocking out (with 1 per cent novocain) the sympathetic ganglionated chain which supplies the vascular tree of an extremity, or by surgical removal of the ganglionated sympathetic chain. Absolute hemostasis must be obtained and continued until the intrasaccular toilet is completed. The technique of the operation is described in detail.

With the technique described, there is no disturbance or interference with the vessels belonging to the collateral circulation. Heat should not be applied to the extremity as it increases the demands for a greater vascular supply and, if this is not forthcoming, varying degrees of anoxia result which may bring about tissue destruction and necrosis. The patient is kept in bed for from ten to fifteen days postoperatively. However, this operation is contraindicated in all arterial aneurysms in which the blood supply cannot be unequivocally controlled during the entire operation.

HERBERT F. THURSTON, M.D.

Palma, E. C.: Arteriectomy in Segmental Arteritis (Arteriectomia en la arteritis segmentaria). *Bol. Soc. cir. Uruguay*, 1943, 14: 645.

Palma states that until lately the medicinal treatment of thromboangiitis obliterans has been ineffective. The use of sulfathiazole, however, seems to be somewhat efficacious. He believes that when medical therapy fails surgery should be done, and suggests segmental obliteration of the superficial artery.

In his report of 6 cases, 3 patients were operated upon for senile arteritis and 3 for thromboangiitis obliterans. In none of the patients with senile arteritis did the operation result in the establishment of a better circulation in the leg. The best that could be said for the operation is that it did not aggravate the condition of the patient. In 2 of the young patients with obliterating arteritis, the circulation was greatly improved.

Arteriectomies are simple technically and may be performed under local anesthesia. In 1 of the 3 patients whose case histories are reported in detail, 40 cm. of superficial femoral and popliteal arteries were removed.

The author states that his limited experience does not permit conclusions. However, he is of the opinion that segmental arteriectomy in thromboangiitis obliterans is a palliative therapeutic procedure with undoubted benefit to certain patients, particularly young ones, in whom the ordinary medical treatment has failed. STEPHEN A. ZIEMAN, M.D.

BLOOD; TRANSFUSION

Amorim, A. and Castello Branco, J. M.: Reinfusion of Blood from Hemothorax (Da reinfusão nos hemotóraces). *Rev. brasil. cir.*, 1943, 12: 35.

Reinfusion of a patient's own blood in acute anemia offers the following advantages: (1) a financial saving because no donor is necessary, (2) immediate availability, and (3) no necessity of typing.

The possibility of injecting a coagulum, fraught with the danger of a pulmonary embolism, must be considered, in addition to the danger of contamination. As a rule, in cases of recent origin, bacteria are destroyed in the circulating blood or by the reticuloendothelial system.

In a great many cases of hemopneumothorax there is visceral collapse with a resulting spontaneous hemostasis which prevents a loss of blood incompatible with life. The author reinfuses the patient's own blood in hemorrhages in the course of, or after, operations on the chest, especially intrapleural pneumolysis. Pleural effusion, which may develop after the operation, creates a certain danger because the liquid mixed with the evacuated blood may provoke a hemoclastic crisis. However, this complication can usually be successfully combated with intravenous injections of adrenalin or calcium gluconate.

The author uses a trocar, as employed in thoracoscopic examinations, for evacuation of the blood.

Three hypotheses have been advanced to explain the fact that blood present in the pleural cavity in

cases of hemothorax remains liquid: (1) the pleural lining is identical with the endothelium of the blood vessel walls; (2) the respiratory movements agitate and defibrinate the blood; and (3) the serosa secretes an anticoagulating substance.

The second theory does not explain why blood in hemarthrosis or hemoperitoneum remains liquid. The third theory, although not proved, is the most appealing one.

The authors report 3 cases in which they saved life by employing an autotransfusion. In 2 cases the hemorrhage resulted from an intrapleural pneumolysis and in the third case from a penetrating injury of the chest followed by a hemopneumothorax.

JOSEPH K. NARAT, M.D.

Herbst, W. P., and Weinstein, J. J.: Observations of the Action of Koagamin. *J. Urol.*, Balt., 1944, 51: 325.

The effect of an aqueous acid solution of oxalic acid and malonic acids (koagamin) upon the bleeding, coagulation, prothrombin time, and the amount of bleeding during and after operation is noted.

There is a decrease in bleeding and coagulation times thirty minutes after injection of the drug and this continues in most cases for as long as one and one-half hours after the original injection.

The prothrombin time is not affected significantly and this suggests that the action of oxalic acid is upon the late phases of the clotting mechanism of the blood.

No serious thrombophlebitis was noted in this series.

These results with koagamin are encouraging and further study of a large series of cases seems justified.

JOHN A. LOEF, M.D.

RETICULOENDOTHELIAL SYSTEM

Polowe, D.: Splenectomy in Pregnancy Complicated by Thrombocytopenic Purpura Hemorrhagica. *J. Am. M. Ass.*, 1944, 124: 771.

A white patient twenty-nine years old who suffered from thrombocytopenic purpura hemorrhagica was first seen by the author in her sixth month of gestation. Splenectomy was performed in the eighth month of gestation. She was delivered of a normal baby two weeks prior to estimated term.

It is believed that this is the first reported case of splenectomy in pregnancy complicated by thrombocytopenic purpura hemorrhagica. Sixty-one instances of this complication of pregnancy have been reported between 1867 and 1936, as shown by the author's review of the literature.

HAROLD C. OCHSNER, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

Gill, A. J.: Traumatic Autograft of Splenic Tissue in the Body Wall. *J. Lab. Clin. M.*, 1944, 29: 247.

Following a short review of the literature, Gill presents a case history in which the patient sustained a bullet wound through the lower part of the left chest at about the level of the 10th rib in the posterior axillary line.

About fifteen months later the patient suffered a rupture of the diaphragm with diaphragmatic hernia; this was repaired about three weeks after the accident. At the time of repair the apparently intact spleen was found to be adherent to the lower surface of the diaphragm and to the posterior chest wall near the spine. It was dissected free and removed to facilitate closure of the rent occurring in the diaphragm.

About nine months after operation, a small subcutaneous mass in the left posterior axillary line, which was known to be present in the scar of the bullet wound prior to the operation for repair of the diaphragmatic hernia, increased rather rapidly in size and became painful. Shortly after change in size was noted, the patient developed typical malaria. Operation revealed a mass of characteristic splenic tissue lying in the chest wall between the broken ends of the tenth rib.

While a positive diagnosis of "malarial" splenomegaly in the autograft of the spleen cannot be made, this condition is indicated.

BENJAMIN GOLDMAN, M.D.

SURGICAL TECHNIQUE

WAR SURGERY

Eve, F. C.: Resuscitation of the Drowned. *J. Am. M. Ass.*, 1944, 124: 964.

A comparative study of the outstanding methods of resuscitation which include the Schaefer, the Schaefer-Nielsen, the Sylvester, and the rocking methods, is made. Each has its place in resuscitation.

During attendance on a child critically ill with diphtheria, whose diaphragm was paralyzed from the disease, a method was hit upon by Eve whereby the alternating up and down head posture could be easily effected. The child was placed in a prone position in a long rocking chair, in such a manner that the weight of the abdominal contents could push and pull the diaphragm up and down in a piston action. This was done continuously by the child's parents until complete recovery of the child's breathing was obtained, and the paralysis of the diaphragm passed away. The method's usefulness and application in the resuscitation of the drowned was readily recognized.

Because of the failures of the Schafer method, the rocking method was resorted to and adopted by the Royal Navy for drowned victims. The method consists in tying the patient's ankles and wrists to a stretcher and seesawing him on a trestle, or a loop of rope slung from hammock hooks. Its use in a crowded life-boat is readily accomplished by rocking the individual over the locked forearms of 2 operators.

There are three essentials of resuscitation according to the author. These consist in ventilation, circulation, and warmth directed to supplying oxygenated blood to the nerve cells which maintain respiration and tone. The merits of rival methods of resuscitation will be judged more by their effect on the circulation than on ventilation. It is claimed that the rocking method completely fulfills these demands. STEPHEN A. ZIEMAN, M.D.

Gear, H. S.: Hygiene Aspects of the El Alamein Victory. *Brit. M. J.*, 1944, 1: 383.

The retreat of the Eighth Army from Azala in June, the defensive phase on the El Alamein line from July to October, and the eventual attack and victory in October and November, 1942, posed complex and serious problems in preventive medicine and hygiene. Studied, and on the whole successfully solved, were problems concerning sanitation and the spread of excremental disease, typhus prevention, desert sores, and other diseases, as well as questions concerning the dangers of captured areas fouled by the enemy. Both ground and documents captured indicated that hygienic problems were not energetically studied in the opposite camp.

In contrast, the Eighth Army in October and November, 1942 was probably as fit mentally and physically as any army has ever been. Preventive medicine provided protection from infectious disease, maintained a high level of physical fitness, insured adequate rations and water supply, and led to the adaptation, so far as possible, of clothes, equipment, and camping conditions to accepted physiological requirements. Dysentery and diarrhea were the most frequent causes of admission to field medical units. Infective hepatitis was common and increased in frequency from September to November. The incidence of digestive disturbances, inflammation of areolar and skin tissue, and accidental injuries was relatively high. WALTER H. NADLER, M.D.

Wilson, J. V., and Salisbury, C. V.: Fat Embolism in War Surgery. *Brit. J. Surg.*, 1944, 31: 384.

As a result of the study of the pathology of trauma, the war surgeon realizes that in so-called "surgical shock" he must eliminate blast injuries, the crush syndrome, and fat embolism.

Opinions as to the incidence of fat embolism vary widely, but most workers agree that in the routine postmortem study of cases of trauma some degree of fat embolism can be found, but this is rarely severe.

The authors' study is based on 1,000 consecutive battle casualties admitted to the surgical wards of a military hospital. No attempt was made at selection; the only proviso made was that in the cases which recovered, the injury should have been serious enough to warrant the patient's stay in the hospital for at least a week. These patients suffered from all types of war injury, usually multiple, but 119 suffered from fracture of the long bones only, no other injury being present. In this series of 1,000 cases the authors had 8 cases of clinical fat embolism, 6 of which terminated fatally. This gives a total incidence of 0.8 per cent in all battle casualties, and a mortality rate of 75 per cent.

Most workers agree that the majority of cases of clinical fat embolism are associated with trauma. Blast injuries alone do not produce clinical fat emboli; but if there is pulmonary concussion present, then trauma which alone would appear trivial may precipitate fat embolism severe enough to cause death.

Theoretically, the fat emboli may have two sources of origin—either from the depot fat, especially that at the site of injury, or from the fat of the blood stream itself. If it does not arise locally, there are two possibilities: (1) a substance such as histamine may originate in the injured tissues themselves, which, circulating in the blood, might alter the state of the blood fat and/or mobilize storage fat; and (2) the fat deposits may be under joint nervous and hormonal control. Neither of these postulates has any experimental support.

Closely coupled with this problem of origin of the fat emboli is the question of entry into the circu-

lation. If they arise from the blood fat then a portal of entry is not necessary, but if the chief source is local then we must postulate that some factor, possibly local pressure, drives the fat into the broken capillaries and veins, or else into the lymphatic system. Most workers favor a venous origin, as the lymphatics appear to be unimportant as a source of spread of the fat globules in the majority of cases.

While it is generally accepted that most of the symptoms of fat embolism are due to simple blockage of the smaller vessels, there is some experimental work to support the theory that the fat globules may have a local action on the capillary walls.

It would appear from experimental and clinical observations that the fat globules first appear in concentration in the smaller vessels of the pulmonary circulation. Later they may enter the general circulation, either by passing through the lungs or via a patent ductus arteriosus and so give rise to emboli in various organs, but especially the brain and kidneys. Thus, we would expect to find most of the lesions in these three organs, but other organs such as the heart, skin, and general musculature cannot always escape. The postmortem diagnosis rests on the findings of pulmonary hemorrhages and the characteristic appearance of the brain. In the fresh preparation of lung tissue, fat globules can be seen and the diagnosis is finally confirmed by osmic-acid staining of the lungs, brain, kidney, and heart.

The onset of fat embolism usually occurs during the second or third day, but it may occur within a few hours and seldom not later than the fifth day. The onset is usually sudden, the patient becoming dyspneic, pale, cyanosed, and restless. A fever, usually of about 103° F., accompanies the increased respiratory rate and quick pulse, but the blood pressure usually remains steady and only falls when cardiac failure sets in. The patient usually complains of pain and tightness in the chest and has a cough, bringing up a frothy sputum which may be blood-stained, especially if there has been a chest injury. Signs of systemic emboli soon set in; indeed, coma may be an early feature and occur concurrently with the pulmonary symptoms. There may first of all be a period of nervous irritation, as shown by increased restlessness and delirium, and at this state the patient may be very difficult to nurse. There may be epileptiform fits. Then, as the patient lapses into coma, various neurological signs develop. There may be increased reflexes and spasticity prior to the eventual paralysis of various groups of muscles. Some cases show loss of sphincter control. There is often irregularity of the pupils and interference with the light reflexes.

X-ray examination of the chest and skull are helpful, but not diagnostic, while the few reports on the electrocardiographic tracing in these cases show that no definite change can be expected.

Neither the urine nor sputum is of great value for early diagnosis, but the examination of the blood itself becomes very important. A dark-ground illumination may be of great value. Lung puncture and the examination of the material both under dark-ground illumination and when stained by Sudan III appear to be very helpful.

The treatment of fat embolism is very unsatisfactory, and at the present state of our knowledge must be empirical. Prophylactic measures consist of early immobilization of fractures with a minimum of manipulation, and aspiration of any fluid or hematoma which may collect around the site of the injury. The application of a tourniquet during manipulation and operation is advised by many and would appear to be a reasonable precaution.

For treatment, the authors suggest venesection, if the blood pressure allows it, followed by intravenous therapy—either with whole blood or glucose-saline solution. In view of the fact that insulin may aid the liver to remove fat from the blood, the authors have used it and consider it helpful, although the results are by no means dramatic. Care must be taken not to increase the pulmonary edema. For the dyspnea and cyanosis, the administration of oxygen by means of a B.L.B. mask is extremely helpful. Sedatives may be necessary in the irritative stages of cerebral embolism. When pneumonia develops, treatment is along the usual lines.

JOSEPH K. NARAT, M.D.

Porritt, A. E.: Military Surgery in the "Middle East." *Brit. J. Surg.*, 1944, 31: 208.

This description of the work and working conditions of a "Line of Communication" desert hospital is based on eighteen months' experience from March, 1941 to September, 1942. The hospital under discussion possessed only a few huts and had most of its patients under canvas. The development and location of the hospital are described. Environmental problems resulted from the high temperatures and dust storms. A number of cases of post-operative heat exhaustion were encountered, but sunstroke was conspicuously absent. During dust storms all essential work had to cease, especially in the operating theater, but the sand-dust appeared to be surgically innocuous and relatively sterile. Occlusive dressings were used to prevent the percolation of sand to the wounds. Conditions affecting the personnel, including black-out, food, exercise, and sanitation are discussed briefly. Tropical diseases encountered included dysentery, which was predominantly bacillary, malaria, and infective hepatitis.

The two principal divisions of the hospital (medical and surgical) consisted of a maximum of 800 beds each. Special departments were conducted, the work for the most part being done by general surgeons. Surgical equipment was adequate without being excessive. Cases were admitted either from neighboring camps, from ambulance trains, or as transfers from other medical units. An average of 30,000 patients a year were admitted to the hospital, of which 12,000 were surgical admissions. Among the latter, battle casualties and nonbattle casualties occurred in the proportion of 1 to 2.5, i.e., the aver-

age number of battle casualties per annum was 3,500. Some 3,000 operations were performed per year, or about 25 per cent of the surgical cases admitted were operated upon. Considerable attention and organization were devoted to the reception of convoys so that it was certain that 250 patients of an ambulance train could be thoroughly accommodated within an hour of the arrival of the first patient. Blood transfusions and sulfonamides were used extensively. Supply difficulties limited the use of gas and oxygen and the climatic conditions made inhalation anesthesia of doubtful value for general use. All types of anesthesia were used, including local and spinal, but chief reliance was placed upon pentothal, which was used to anesthetize at least 85 per cent of the battle casualties.

Battle casualties accounted for about one-third of the surgical work of the hospital. Sepsis, except in the most trivial superficial wounds, was constant, but in the Middle East it was a very low-grade sepsis and did not constitute a major factor in treatment in more than 10 per cent of the casualties. Two tendencies in surgical treatment were observed; one was toward steadily increasing conservatism, and the other toward standardization as far as possible of routine treatment. Considering the length of the lines of communication, the wounds and the patients were for the most part in surprisingly good condition when they arrived at the hospital. This was attributed to resuscitation measures, the use of sulfonamides, wound toilet, and immobilization in the forward areas. Foreign bodies were dealt with conservatively and the temptation to dig out every foreign body was strongly resisted. While there is no field for primary suture in war wounds, there is a very extensive one for secondary suture at about the tenth- to fourteenth-day period. Amputation was carried out relatively far less than in the last war, and in this hospital averaged about 5 cases per 1,000 battle casualties. No case of tetanus was encountered and only 4 cases of gas gangrene were seen during this whole period. While the thoracic and head wounds that reached the base responded very well to conservative measures, abdominal wounds continued to produce disappointing results, and in comparison with the results of the last war there was very little improvement. The results of tannic-acid treatment of burns were extremely bad, and the most satisfactory substances used proved to be sulfanilamide powder, cod-liver oil, and vaseline. Skin grafting was performed more frequently in the later months with encouraging results.

The significant advances in war surgery as seen in the Middle East are due to the increased facilities of the forward medical units; the evacuation of casualties by air; the greatly increased use of blood transfusion methods from front line to base; the use of sulfonamides locally and generally; the extended use of plaster immobilization for wounds of the soft tissues as well as for fractures; and the use of early skin grafting for burns and wounds.

JOHN L. LINDQUIST, M.D.

Longland, C. J., and Kessel, L.: The Parachute Surgical Team. *Lancet*, Lond., 1944, 246: 381.

A surgical subunit capable of providing for wound surgery in an airborne formation is a natural development of the medical services in modern warfare. The need for it arises from the overriding necessity of early and thorough surgical intervention in war wounds; and it has been almost wholly from this standpoint that the difficulties and occasional doubts have been tackled and overcome.

The surgical team is composed of 5 members. First is the surgeon; then one member is responsible for resuscitation and preoperative attention and 2 members are chosen for their nursing ability. This little unit, with an anesthetist attached, is responsible for the preoperative treatment and surgery of all cases passed on to it in the dressing station of which it is a part. It is also responsible for postoperative attention to grave cases, nursed separately.

Two factors govern the choice of equipment: it must be transportable in the normal aircraft containers, and it must be such that the entire bulk may be managed over varying country and possibly under fire. No theater furniture other than a light operating table or stretchers and trestles can be carried; the remainder must be improvised on arrival at the building previously chosen for the job. Much of the bulk of the equipment is made up of expendable items such as anesthetics, plaster, dressings, plasma, and fuel. These, except for the last two items, are put up in a standard pack designed for the requirements of 10 cases. Compressed materials are used to some extent. Sulfanilamide powder, soft-paraffin gauze, and prepared swabs are sterilized and included in these expendable packs.

Instruments present no problem in packing and are not damaged when the equipment is dropped. Standard, simple instruments are used, their variety being ruthlessly cut down, but 2 excision sets and additional abdominal and bone sets are needed. Plenty of detachable knife blades are considered no luxury. Linen thread is the basic ligature material, but small quantities of atraumatic catgut and silkworm gut are included. Instrument trays, bowls, and dishes take up a good deal of valuable space; a sterilizer and boiled-water container are bulky, but equipment can be carried inside them and they are very useful. Water may present a serious problem, so that a number of collapsible containers are included for its storage.

The provision for heating and lighting is perhaps the most serious difficulty. Primus stoves are fairly satisfactory if several are available and time for their maintenance can be spared. They are at present the source of heat. Adequate lighting is provided by paraffin pressure lamps and the indispensable electric head-lamp.

Because each item must be so carefully considered, one or two interesting sidelights have emerged. For instance, about 40 per cent of the cases required plaster of Paris; acriflavine tablets proved to be the most economical and useful antiseptic for general

use; and it was found that a variety of suture materials could be replaced by a single roll of thread.

Of nearly 150 cases in one session, only 11 required any anesthetic other than pentothal alone. Ether was used, but the danger of fire in a theater where primus stoves and oil lamps are employed has now been distressingly and effectively proved. In each team, one or two orderlies quickly learned the technique of intravenous anesthesia; when additional anesthesia was necessary, chloroform was used.

CHARLES BARON, M.D.

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Bastos, E. da S.: The Use of Cotton as Suture Material; A Study of 1,000 Cases (O fio de algodão como material de sutura cirúrgica; estudo baseado em 1.000 operações). *Hospital*, 1943, 24: 697.

Two distinct phases may be distinguished in the healing of operative incisions: the phase of dissimilation and the phase of assimilation.

During the first phase a coagulum forms and an elimination of devitalized tissue takes place. Three mechanisms are responsible for liquefaction: (1) autolysis, caused by the action of proteolytic enzymes on dead cells; (2) heterolysis, namely, the enzymatic action of extravasated leucocytes; and (3) the enzymatic action of microbes. Peripheral hyperemia, which is chiefly of mechanical origin, results from a disintegration of the tissues. Certain products originating at the site of the trauma may display a vasodilating effect. Four zones may be distinguished in a wound: (1) zone of coagulated fibrin, (2) zone of liquefaction or proteolysis, (3) zone of aqueous imbibition, and (4) zone of hyperemia.

The phase of assimilation or reconstruction is the sequel of hyperemia which causes a diapedesis of the leucocytes, especially the polynuclears; furthermore, new blood vessels are formed. The proliferation of angioblasts is provoked by the action of enzymes. Finally, granulation buds form.

All these intricate processes are disturbed less by cotton than by absorbable sutures. Another disadvantage of catgut is the problem of sterilization. Moreover, allergy to catgut has been noted.

Of various nonabsorbable sutures, such as silk, linen, nylon, plastigut, steel alloy wire, and cotton, the author prefers the last one. He has been using cotton in major surgery for the last three years with excellent results. Its natural twist facilitates tying. The *p*H of mercerized cotton ranges between 6.8 and 7.2.

Cotton offers the following advantages: it has a considerable tensile strength, can be easily sterilized, is very flexible and, last but not least, it is very inexpensive.

JOSEPH K. NARAT, M.D.

Webster, J. P.: Film-Cemented Skin Grafts. *Surg. Clin. N. America*, 1944, p. 251.

The author lists the difficulties in removing a thin graft from a dermatome. These are the shrinking of the graft, and the adherence of the surfaces of the graft (a tendency increased by the elastic rubber-cement film adherent to the epithelial surface). He now uses pliofilm cemented to the drum then covered by the cement to which the graft adhered while being cut. The graft is then removed from the drum with its epithelial surface covered by the strip of pliofilm. This prevents the graft from rolling back and becoming adherent to itself and makes its application to the defect, with or without suture of the graft, less difficult. Transparency of the film enables one to see the graft and recipient area while fixing the graft in position. It also gives the advantage of allowing observation of the graft during healing.

Several methods are available for the immobilization of the graft in position. They may be divided into those with and those without suture.

Of the suturing methods, there are two types: one is the overlap method and the other is the edge-to-edge method. With the overlap method continuous sutures are taken after the film and graft are tacked about the defect with a few interrupted sutures, so as to approximate the graft and the margins of the defect. The overlapping edge of the graft and film is then trimmed away to the sutured portion.

HOWARD A. MCKNIGHT, M.D.

Finley, R. K., Shaffer, J. M., and Altenberg, A.: Parenteral Fluid Administration beneath the Fascia Lata. *Am. J. Surg.*, 1944, 63: 337.

The relative merits of hypodermoclyses and of intravenous infusions in the administration of isotonic or near isotonic fluids are discussed in this article.

The dangers of intravenous infusions are put forth as follows: (1) immediate reactions; (2) overburdening of the circulatory system by rapid increase in the blood volume; (3) thrombosis and concomitant embolus formation at the site of injection; (4) the danger of dehydration because of the use of hypertonic solutions; and (5) the production of general edema.

The disadvantages of clysis are: (1) severe pain and discomfort at the site of injection; (2) immobilization of a postoperative patient for several hours at a time when frequent turning is greatly desired; (3) local pressure ischemia at the site of injection due to swelling and distention; (4) frequent slow absorption; and (5) the danger of infection in the subcutaneous tissues.

In an effort to obviate the disadvantages of hypodermoclysis and still make use of the many desirable factors this method offers, the authors studied various methods of subcutaneous fluid administration. It was found that regardless of the site, the introduction of fluids immediately under the skin caused a rather violent disruption of the subcutaneous tissue and, unless the patient was decidedly dehydrated, only from 50 to 100 cc. of fluid could be delivered per hour without marked discomfort. Moreover, there is no pain experienced while subcutaneous infusions are given if the fluid is not

given at a speed greater than the ability of the tissues to absorb it. Utilizing the large potential space for absorption immediately beneath the fascia lata, Finley *et al.* found that "sub fascia lata" hypodermoclysis gave gratifying results, obviated many of the disadvantages, and merited pre-eminent consideration when parenteral isotonic or near isotonic solutions were required.

The technique consists in inserting a standard 18-gauge hypodermoclysis needle at a 45 degree angle through the fascia. The solution is suspended approximately 3 feet above the leg and allowed to run as rapidly as possible. The needles are not taped to the skin as they are held in place by the fascia, nor is there any danger of breakage of the needle as long as it is not taped.

Analysis of 261 consecutive "sub fascia lata" hypodermoclyses revealed that absorption of 100 cc. of either physiological saline solution or 5 per cent dextrose in saline solution was completed in fifty-six minutes. The saline solution was absorbed at a slightly more rapid rate than was the dextrose, the average time required being fifty-three minutes as compared to fifty-seven minutes.

For comparison, the time for absorption of 1,000 cc. of fluid on the medial aspect of the thigh was computed in 33 cases; the average length of time was one hundred sixty-seven minutes.

Since pain has always been a major objection to administering subcutaneous infusions, the pain threshold in the different patients was evaluated as accurately as possible. Sixteen per cent of the patients experienced pain. Fewer complained of pain following the administration of saline solution than following dextrose infusion. There was a slight but definite relationship between pain and the speed of absorption. Swelling of one or both legs was observed in 22 per cent of the patients, the swelling being more common when dextrose was given. There was only one complication—an extensive infection on the lateral aspect of the leg in 1 patient. He had received 20 hypodermoclyses, some started subcutaneously by the nurses. Abscesses developed along the leg but were entirely subcutaneous.

Although the fluid under the fascia lata did not pool, nevertheless comparative studies were made of the rates of absorption following intravenous and subfascial infusion. These were conducted by giving 1,000 cc. of 5 per cent dextrose in physiological saline solution, to which had been added 1 cc. of phenolsulfonphthalein, both intravenously and subfascially, to the same patient on different days. The tests were conducted both on patients in good health, and on patients with known kidney damage. The rate of flow was adjusted so that both types of infusion were delivered in one hour. On comparing the rates of excretion of the dye, it was found that there was only a difference of one hour following the two types of infusion. Since the rate of delivery of the two solutions to the patient was adjusted in such a manner as to require 1 hour, there was immediate absorption of the fluid in either case.

Contraindications to subfascial infusion included patients with generalized edema or in shock. Although work was limited to "sub fascia" infusion with physiological saline solution and 5 per cent dextrose in saline solution, other solutions can be delivered to a patient by this method. Because of the minimal amount of discomfort and swelling, no more than 1 liter of infusion was given at a time. The infusion may be repeated several times daily if necessary with perfect safety and minimal discomfort.

STEPHEN A. ZIEMAN, M.D.

Gilligan, D. R., Dingwall, J. S., 3rd, and McDermott, W.: The Parenteral Use of Sodium-Lactate Solution in the Prevention of Renal Complications from Parenterally Administered Sodium Sulfadiazine. *Ann. Int. M.*, 1944, 20: 604.

A study of the findings in approximately 100 patients, chiefly postoperative surgical cases, shows that alkalinization of the urine with M/6 sodium-lactate solution administered parenterally prevents crystalluria and renal complications consequent to crystalluria during therapy with the usual doses of parenterally administered sodium sulfadiazine.

The initial dose of sodium lactate required to alkalinize the urine at the onset of therapy with sodium sulfadiazine depends on the degree of acidosis present and varies usually from 500 to 1,500 cc. of M/6 sodium-lactate solution in adults with normal kidney function.

Thereafter, 1,000 cc. of M/6 sodium-lactate solution are given daily; it is divided into two doses which are administered every twelve hours to adult patients receiving sodium sulfadiazine; this is usually appropriate to maintain the urine alkaline and prevent crystalluria due to the sulfadiazine.

The plasma dioxide content is not greatly affected by this dosage of lactate solution. No evidence of clinical alkalosis has been observed in the authors' series of patients. From the results of the studies of sulfadiazine concentration of the blood following intravenous injections of sodium sulfadiazine, it is advocated that the drug be administered in the relatively low concentration of 0.5 per cent of M/6 sodium-lactate solution, or certain other parenterally utilizable isotonic solutions, rather than in 5 per cent solution in water.

HOWARD A. MCKNIGHT, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Rabinowitz, H. M., and Pelner, L.: Topical Application of Horse Serum in the Treatment of Extensive Burns. *Am. J. Surg.*, 1944, 64: 55.

It is not the purpose of this article to review the multiple and diverse views expressed on the subject of the management of burns, but rather to take into consideration all of the newer concepts of the disturbed physiology resultant from burns and to crystallize a simple, adequate, applicable form of treatment which can be utilized under conditions of

the various exigencies of combat as well as of civil emergencies. Obviously, treatment which is based upon silencing the source of the trigger mechanism mediating the remote disturbed physiology in burns and combating the latter with appropriate measures is most desirable.

In 1923, Rabinowitz, in charge of several extensive burns, made the observation that the excessive blood plasma the body pours out over a burned skin area several days after the original burn does not jell or coagulate readily under the heat of an electric bulb, which was then being used in the local treatment of burns; moreover, that the local application of horse serum to the burned area yielded an adequate jelling of the plasma under the heat of the same electric bulb. On the basis of this phenomenon, it was believed at the time that the local application of horse serum tended to act as a physiological plug to excessive plasma loss and in addition to aid the healing as a result of the bactericidal properties of serum and plasma. On this basis, the topical application of normal horse serum was used in severe burns for upwards of fifteen years. A review of the literature revealed a case report by Robinson in 1917 and later reported by Montieth and Clock. In this series, freedom from pain and toxemia, and the low incidence of severe dehydration was an outstanding feature in all the cases regardless of the degree of burn. This, of course, excluded those patients who made an exitus in the first few hours after admission. By far the most gratifying observation was the perfect epithelization of the burned area, which obviated the necessity for skin grafting.

The method of treatment of severe burns consists of the following steps:

1. Treatment of burn shock. It is this stage that has received the most attention in the literature during the past few years. Although transfusions were used generously in the early years of this method of treatment, it is conceivable that the results would have been further improved if plasma transfusions and adrenocortex extract had been available.

2. Breaking of the blebs, if readily accessible, with sterile scissors.

3. No washing of the burn unless it is grossly contaminated, and no débridement.

4. Spraying of the burn with normal horse serum, with a nonmetallic atomizer, at first every hour and then at longer intervals. A small heat lamp is played over the area until the serum and plasma are coagulated.

5. After from ten days to two weeks, the burned part is soaked in sterile saline solution and as the eschar separates, spraying and saline washings are repeated until complete epithelization takes place.

Fifty-two patients with severe burns of second and third degree were treated in this manner. Eight patients in whom more than 75 per cent of the body surface was involved did not recover and died within a few hours. This is a common finding with all accepted treatments. In the recovered cases, the rate and extent of healing seemed to be remarkably fast. The absence of infection and pain was most outstanding. The healed burns exhibited little or no scarring and contractures commonly due to burns were not in evidence. In only 1 case was there evidence of a reaction due to the medication, and that was a case of mild serum sickness (hives) in a severe burn. This reaction required no treatment.

Experimentally, rats were given a small third-degree burn and treated with: (1) normal horse serum containing 0.30 per cent cresol; (2) tannic acid; (3) silver nitrate and tannic acid. The rats were sacrificed in one week. The burned skin was examined grossly and microscopically. In the serum-treated group the skin was soft and pliable, there were no evidences of infection, and there were attempts at healing. In the tannic-acid-treated group, the skin was stiff and nonpliable, and there were invariably evidences of suppuration. The tannic-acid treatment of burns is subject to these well founded criticisms: infection is almost always present under hard nonpliable crusts, which produces more contractures and thus necessitates more skin grafting. Central lobular necrosis of the liver is a prominent finding in deaths caused by burns and treated with tannic acid.

One of the most gratifying effects of the horse-serum treatment is the freedom from pain. The excruciating pain of a burn ceases almost immediately following the application of horse serum. The amount of morphine that has to be given is very small indeed, even in severe burns. In 1937, Rosenthal found a histaminoid substance in the blood of burned animals. This substance would doubtless be an irritant to the sensory nerve endings, and produce severe pain. Rosenthal found that this histaminoid substance was neutralized by serum from human beings and animals in the healing stage of burns, and that even normal serum would do this to some extent. In the topical application of normal horse serum to burns, this toxin is neutralized at the source.

The absence of infection in the serum-treated wound is striking. It is doubtful, however, that the small concentration of cresol that keeps the horse serum sterile could be a factor in keeping the wound sterile. It must certainly be true that something in the horse serum helps the superficial layers of cells to fight the bacteria that seek to destroy them. The bactericidal activity of normal horse serum has been the subject of many extensive reports, chiefly by Gordon, Mackie, and their coworkers.

Reference is made to the pouring out of an excessive amount of plasma from the burned area with failure of the plasma to jell adequately. The burned area literally appears to weep torrents of plasma. It does not make sense to continue to pour plasma into the circulation while it seeps out of the burned areas like rain through a porous roof. The accumulation of plasma in the tissues around the burned area may still be restored to the vascular system if and when the constant seepage of plasma

oozing out of the burned surface is physiologically plugged. For many years the principles involved in the alteration of proper jelling of the plasma in burned areas and the mechanism by which application of normal horse serum to burned areas tended to re-establish adequate jelling was not understood. Recently, Rabinowitz has pointed out the important role that the sulfur-amino acids, such as cystine and methionine, play in the mechanism of normal clotting and clot retraction. In advanced stages of prolonged toxemia in burns with liver damage, it is likewise conceivable that the cystine metabolism is impaired with resultant general preponderance of the SH group, e.g., cysteine. In that event, the picture would be parallel to that of thrombocytopenic purpura. Purpuric manifestations and gastroenteric bleeding in the late stages of severe burns is not uncommon and lends added importance to the postulate. Serum or plasma causes a rapid disappearance of the SH groups, e.g., cysteine. Furthermore, normal serum contains cystine and methionine, which tend to restore firm clotting and clot retraction and thereby act as a physiological plug to the constant seepage of plasma from the burned area.

In the entire series, only 1 case showed a mild form of serum sickness. It was thought unnecessary for this reason to test the skin of the patient before the use of topically applied serum. This case of serum sickness was of the type that occurs regularly in patients who are not sensitive to serum following the injection of horse serum.

Although topical application of appropriate medicaments was studied from the standpoint of healing, this should not be taken to minimize the importance of the recent work on the general treatment of burns, such as plasma transfusions and the adrenocortex treatment of burn shock. However, it is the authors' impression that investigators have placed too little stress on local treatment. The ideal consists of a balanced combination of both of these methods.

JOHN E. KIRKPATRICK, M.D.

Siler, V. E.: Surgical Reconstruction Following Serious Burns. *South. M. J.*, 1944, 37: 187.

The problem of reconstruction of the integumentary system after destruction by a burn continues to be one of the main obstacles in the final recovery of the patient. It is almost universally agreed that superficial burns designated as first- and second-degree in depth, heal without grafting. The final reconstructive result in any patient with a severe burn may depend to a large extent upon the initial treatment. In other reports the procedure adopted has been discussed in detail. The two underlying principles in "primary cleansing, compression, and rest treatment" of burns are (1) consideration of the general treatment of the patient, and (2) local treatment of the burned area. It is logical to assume, and clinically borne out, that the most effective measures in general therapy are to control pain, to control hemoconcentration and prevent "thermal shock" by the parenteral administration of blood plasma, and to prevent anoxia by oxygen therapy. Infection may be inhibited or controlled by the systemic use of sulfonamide drugs. Local treatment of the burned area directly deals with the problem of reconstructive surgery. In almost every instance the initial therapy will govern when it can be done. Of the numerous advantages which we believe ointment pressure dressings afford, the outstanding one is the fact that the wound from the very beginning permits any variation in treatment which may be demanded of the surgeon in order to start the grafting of skin. This reason, along with many others, has disseminated the use of ointment pressure dressings in the definitive treatment of burned areas.

After serious deep burns, reconstructive surgery should be considered from the standpoint of early and late skin grafting. Early reconstructive surgery concerns itself with the covering of all raw areas. It is designated as the period dating from the time of the injury until the wounds are completely epithelized. Early reconstructive surgery may be further divided into immediate and delayed skin-grafting procedures.

Delayed skin grafting is now accepted as the procedure of choice for closure of large open burn wounds. There are, however, several principles which should be mentioned. Since skin has been destroyed, early skin replacement is the slogan of which we should be mindful. There are several acceptable methods of accomplishing early skin grafting. Reverdin or pinch grafts are small circular free grafts of varying degrees of skin thickness, the central portion being almost full thickness in depth with a gradual tapering to the periphery. The chief disadvantages are that infected granulation tissue interspersed among them sometimes causes a rubbery type of skin, epithelial proliferation may be slow, and it is difficult to cover extensive areas of the body surface. On occasions the authors use this type of graft, but usually they excise the donor site and thus create a closed wound which should heal per primam.

The thick split-skin graft has been adequately described by Brown and McDowell. The thick split-skin graft, as he has pointed out, differs from the Ollier-Thiersch graft only in degree of thickness. A great many surgeons prefer the application of the entire sheet of skin over the granulating tissue bed. This technique assumes the wounds to be fairly clean before grafting is attempted. In their experience grafting can be done much sooner by a modification of this procedure. The open wound is prepared for grafting as readily as possible. Sloughing tissue is removed with each daily dressing. Infection is controlled as soon as possible by dakinization of the wound. Even though there is evidence of gross infection, skin grafts may be applied when the granulation tissue appears red. The wounds are always covered with fine mesh gauze so that granulations will not grow up through the coarser meshes of the overlying surgical gauze. This would permit them to stick, and lead to painful removal with excessive hemorrhage. "Postage-stamp"-thick split-skin

grafts may be obtained either with the "free hand" or by using the dermatome. The donor site is covered with fine mesh gauze impregnated with either white vaseline or anhydrous wool fat. A surgical pressure dressing completely covers this area; it is made of both sterile mechanics' waste and large folded gauze rolls to create pressure. Meticulous care of the donor's site is important to prevent infection and a prolonged granulating wound. Little is gained if one area of the body is denuded at the expense of another.

The thick split-skin graft can be better manipulated if placed on a large sheet of gutta-percha. The graft should be moistened with physiological saline solution. Small "postage-stamp" grafts are then cut so that they measure about 1 cm. square. These are placed on the open wound in any desired pattern, the gutta-percha being removed at the time of application. After the grafts have been placed, the open wound is covered with a single thickness of surgical gauze dressing and its edge is held to the normal skin by collodion. The wound remains open to the air for eight hours which permits the grafts to "seat" themselves. Subsequently, continuous saline surgical pressure dressings are applied, and although moistened every four hours, remain undisturbed for forty-eight hours. The dressings are removed down to the single thickness gauze at the end of this period and the amount of exudate governs which solution is to be reapplied. If there is considerable drainage, continuous Dakin's dressings are used until the infection is well under control. Pyocyaneus infection may be inhibited by using one-half per cent acetic-acid wet dressings. By the end of the fifth or sixth day, the single-thickness gauze dressing is removed and proliferative epithelization usually continues at a rapid pace. As the discharge subsides, the grafted area is exposed to the air and as soon as possible fine-mesh ointment gauze is applied daily until complete healing has occurred. Using this technique, the authors have grafted large open wounds as early as the sixteenth day after injury, and in some instances the wounds were completely covered with skin by the thirtieth day of hospitalization.

As has been discussed by Brown, Bettman, and other observers, split homografting may prove on occasions to be a lifesaving measure in the extensively, seriously burned patient who becomes debilitated from anemia, infection, hypoproteinemia, and pain. Homografts usually survive from three to ten weeks and then absorb slowly to leave a clean granulating surface.

Full-thickness skin grafts are utilized to the best advantage in late reconstructive surgery. When the surface is constantly exposed to the outside elements and trauma, such as the skin of the face, neck, fingers, and palms of the hands, full-thickness skin grafting should be considered. The surgeon must ever be aware that these grafts are more delicate to handle and that the "take" is more difficult and less certain than split-thickness grafting. Adequate knowledge of splinting of the part and of applying pressure over the graft is an important factor in their successful growth. This procedure should not be considered for the covering of open wounds following deep burns. The size of the graft required is prohibitive, and the graft will almost certainly be lost because of associated infection in these wounds.

Pedicle-flap grafting is only frequently indicated when bony prominences must be covered with subcutaneous tissue and skin. This type of reconstructive surgery is laborious for the surgeon and indeed expensive for the patient since hospitalization is prolonged and multiple operative procedures must be done before the expected end-result is effected.

The authors present the following conclusions:

1. Ointment pressure dressings permit early reconstructive surgery sooner than other types of definitive treatment for serious burns.

2. With ointment pressure dressings there is, perhaps, less contracture and deformity than is seen with eschar methods of treating burns.

3. Immediate skin grafting may be done in carefully selected cases; however, details of this procedure are in the experimental stage and it is not practicable at the present time.

4. When skin is lost, "early skin replacement" is the principle to follow. This can be done consistently by using "postage-stamp"-thick split-skin grafts.

5. It is agreed with Brown and other observers that the best results are obtained in late reconstructive surgery with large thick split-skin grafts and full-thickness skin grafts to correct contractures and deformities.

JOHN E. KIRKPATRICK, M.D.

Tey, A., Criscuolo, E., and Marhuenda, P.: Treatment of Torpid Ulcers of the Extremities with Vitamin C (El tratamiento de las ulceraciones tórpidas de las extremidades por la vitamina C). *Rev. argent.-norteamer. cienc. med.*, 1943, 1: 181.

While making a study of capillary fragility it was noted that in determining the presence of deficiency of vitamin C by the saturation method of Wieters (*E. Merk's Jahresbericht*, 1937–1938, 51:) many previously resistant ulcers healed, often with astonishing rapidity and at times before the condition of saturation could be reached.

The majority of the authors present 15 cases of ulcer which previously had responded poorly to treatment but healed within less than a week under some such dosages as 400 mgm. of ascorbic acid. All of the 15 patients exhibited a vitamin deficiency with the saturation test, and all showed dramatic improvement under the administration of these large doses. The previous raw surface of the ulcer began to granulate, the colorless discharge dried up, the surface became decked with a dry coagulative covering, and the epithelium spread rapidly across the surface.

Some of the ulcers had been treated for as long as a month before the ascorbic acid treatment was started; some were as large as a twenty-five-cent piece, some irregularly shaped; 3 were malleolar ulcers, all but 1 situated on the leg or foot; this 1, on the elbow, healed as dramatically as the others.

From this study the authors conclude that atonic ulcers which cannot be ascribed to any known cause should suggest a lack of vitamin C, and that the administration of ascorbic acid in such a juncture actually constitutes a specific treatment. Furthermore, they believe that such treatment might achieve a certain amount of success in torpid ulcers with an etiology known to be other than that of deficiency of vitamin C. JOHN W. BRENNAN, M.D.

Price, P. B.: The Cause and Treatment of Furunculosis. *J. Am. M. Ass.*, 1944, 124: 1189.

Furunculosis is a disease confined to a limited area of the body and characterized by the appearance of a succession of single boils. Its refractory nature and tendency to relapse may be explained on the basis of continued infection by the external spread of bacteria from the discharge of the initial furuncle. These pathogenic bacteria become attached to the skin surface and then invade the hair follicle or its sebaceous gland. Pathogenic bacteria can become part of the normal cutaneous bacterial flora and thus serve as a constant source of recurrent infection.

The author is opposed to the operative treatment of boils involving such procedures as incision, drainage, and dilatation of sinuses. All fluctuant boils should be permitted to rupture spontaneously. Although the skin cannot be sterilized, he claims that normal skin can be degermed by the use of a solution of ethyl alcohol, 70 per cent by weight. This solution should be applied continuously for a period of twenty minutes, with or without gentle gauze friction of the skin. Best results are obtained in the interval between the healing of the last boil and before the appearance of the next furuncle. Ethyl alcohol cannot be used for the treatment of a draining sinus or when the pathogenic bacteria have penetrated deep into the hair follicle. Eleven proved cases of true furunculosis were treated in this manner with no recurrences for a period of two years.

BENJAMIN G. P. SHAFIROFF, M.D.

Robinson, R. A.: Actinomycosis of the Subcutaneous Tissue of the Forearm Secondary to a Human Bite. *J. Am. M. Ass.*, 1944, 124: 1049.

A case of actinomycosis secondary to a human bite was observed, and 2 similar cases were found in the literature.

Actinomycetes indistinguishable from the known pathogenic actinomyces bovis have been isolated from normal and diseased human mouths by several students of actinomycosis.

Experiments show that actinomycetes from the human mouth can cause true actinomycosis in animals.

It is logical to suspect actinomycosis in any persistent inflammatory lesion which stubbornly resists treatment, especially at the site of a human bite.

It would seem from the few cases so far reported that with adequate surgical treatment the prognosis in cases of actinomycosis secondary to human bites is excellent.

A human bite can transmit pathogenic actinomycetes and cause actinomycosis.

CHARLES BARON, M.D.

Kramer, G. B., and Sedwitz, S. H.: Ceepryn. Clinical and Bacteriological Studies. *Am. J. Surg.*, 1944, 58: 240.

Ceepryn (cetylpyridinium chloride) was tried clinically in the form of the 1:200 tincture as a preoperative skin antiseptic on 50 consecutive cases, including upper and lower abdominal laparotomies, herniorrhaphies, and saphenous ligations. The preparation consisted of scrubbing the dry-shaved operative field twice with ether, followed by the application of two coats of ceepryn tincture. Cotton-swab cultures were taken before the scrubbing, after the skin preparation, and at the conclusion of the operation, and were incubated aerobically. No anaerobic cultures were made.

All cultures from the operative field before the application of 1:200 tincture of ceepryn were positive; and pathogenic organisms were grown from 8 patients. All cultures from the operative field after the application of a 1:200 tincture of ceepryn were negative. (The authors do not indicate whether precautions were taken to neutralize or dilute the drug on the swabs beyond the bacteriostatic range.)

Forty-five cultures made from the operative field after the operation was completed and before the surgical wound was dressed were negative. Five cultures were positive and these showed nonpathogenic organisms. No instance of irritation or drug idiosyncrasy was observed and no postoperative infections occurred.

The authors conclude that ceepryn is a highly effective, nonirritating cutaneous disinfectant for securing a sterile operative field. (No control series of cases was made to parallel the ceepryn-prepared cases.) EDWIN J. PULASKI, M.D.

ANESTHESIA

Gould, R. B.: Anesthesia for the Patient in Shock. *Anesthesiology*, 1944, 5: 129.

The chief duty of the anesthetist in the shock case is to avoid any agent or technique which might enhance the attendant anoxia. The manifestations of shock include pallor, thirst, vomiting, perspiration, oliguria, a rapid, weak pulse, and declining systolic and pulse pressures. Moon's theories on this condition are brought forward with emphasis on the progressive circulatory deficiency, hemoconcentration and generalized anoxia. Stress is laid upon the fact that a fall of the blood pressure is not an essential feature of shock, for the latter may be present while the arterial pressure is well maintained. A period of observation before operation is essential for the evaluation of the degree of shock. Hemoconcentration is considered one of its earliest signs. An erythrocyte count from five to six million represents a hemoconcentration of 20 per cent, and is an infallible sign of the presence of shock even in

the absence of any other effects of circulatory deficiency. A concentration of 40 per cent is a grave sign and is usually accompanied by a fall of the blood pressure, while a concentration of over 40 per cent leads to a grave prognosis. In the estimation of the anesthetic risk of a patient in shock, age is considered of prognostic importance, the mortality being eight times as great in patients over fifty years of age as in patients below this age.

Adequate resuscitation is imperative and surgery should be postponed while shock is present. In a few cases only does early operation save life. The treatment of shock should involve absolute rest in the "head down" position, warmth, simple surgical measures, and intravenous therapy. Plasma, blood, or saline solution can be given as the indication arises. The rate of infusion is usually three-quarters of an hour for the first two pints, with the subsequent rate of 1 pint every three or four hours. A rise of from 10 to 20 mm. of mercury in the systolic pressure may be expected after each pint of blood or plasma is transfused. Oxygen may be a life-saving measure. The selection of the anesthetic agent and the technique to be used is of utmost importance, and the author evaluates the various anesthetic methods available. He considers nitrous oxide and oxygen an inadequate anesthetic for the patient in shock because of the impossibility of producing narcosis in the majority of patients without some degree of attendant anoxia. Ether is the safest agent for experienced and inexperienced anesthetists alike. It can be used alone or as a supplement to nitrous oxide and oxygen. The place that pentothal occupies in the shock case is still a questionable one, more experience being needed before this drug can be well evaluated. MARY KARP, M.D.

Cullen, S. C.: Clinical and Laboratory Observations on the Use of Curare during Inhalation Anesthesia. *Anesthesiology*, 1944, 5: 166.

Experiences with curare during inhalation anesthesia and laboratory investigations of its properties give the impression that curare is a safe drug, and that it is proving to be a valuable adjunct to the anesthetist's armamentarium. Its ability to provide complete muscular relaxation and contract the intestine assists materially in improving the working conditions of the surgeon without significantly increasing the immediate or ultimate hazard to the patient. Its principal disadvantage is the narrow margin between the effective dose and the dose which produces respiratory depression. However, with proper control of respiration, this disadvantage proves to be minimal.

Complete and unqualified recommendation of the drug is withheld pending further clinical and laboratory investigation. It should not be used by the inexperienced and unskilled anesthetist to secure relaxation which is unobtainable because of inadequate anesthesia. Curare can be used successfully and safely only with properly conducted inhalation anesthesia. J. M. MORA, M.D.

McCormick, C. O., Huber, C. P., Spahr, J. F., and Gillespie, C. F.: An Experience with 100 Cases of Continuous Caudal Analgesia. *Am. J. Obst.*, 1944, 47: 297.

The authors present a report of their experience with 100 cases of continuous caudal analgesia, as follows:

ADVANTAGES OF CONTINUOUS CAUDAL ANALGESIA

Labor is dramatically painless. The method may be of special value in cases in which exertion or general anesthesia is contraindicated. The unusual relaxation of the perineal musculature lessens the resistance to the advancing head, and facilitates delivery and breech extraction. It eliminates the need of supplementary anesthesia for normal delivery or repair work. Molding of the fetal head is almost negligible. The risk of maternal inspiration asphyxia is eliminated. In the majority of cases the labor is shortened and facilitated. Uterine bleeding is minimized. The extra relaxation of the rectal sphincter and the absence of discomfort greatly facilitate rectal examination. The vital mechanisms of the child are not suppressed, and, as a result, the infant is afforded extra safety. Because of the freedom from narcosis and absence of molding of the head, the method is definitely favorable to the premature infant. This special protection to the premature infant is perhaps the most outstanding single contribution of continuous caudal anesthesia.

DISADVANTAGES OF CONTINUOUS CAUDAL ANALGESIA

The method is not well adapted to private practice. Since it involves invasion of the caudal canal and carries hazardous potentialities, it is a major surgical procedure and should be conducted only by those fundamentally trained in this specialized form of relief. It is essentially a hospital procedure. The method carries an undesirably high percentage of failures. Such contraindications as hypotension, hypertension, eclampsia, placenta previa (because of increased hemorrhage due to cervical relaxation), uterine inertia, acute hemorrhage, sensitivity to the drug, anemia, hysteria, psychotic states, disproportion, and certain sacral anomalies should be carefully heeded.

Obesity, a small hiatus, or a deformed sacrum not infrequently causes difficulty in inserting the needle. Intrauterine manipulations, such as internal versions, are usually unsatisfactory because of the increased tone of the upper uterine segment and the failure to eliminate discomfort from manipulations made through the abdominal wall above the level of the umbilicus. There is a possibility of peripheral nerve damage. There is a risk of spinal infection. The bladder urge is lost. It is difficult to maintain the desired anesthetic effect longer than six hours. Although the first stage of labor is shortened and the third is simplified, the second stage is prolonged and necessitates increased operative interference. The method is not suitable in trial labor or borderline disproportion cases, nor is it suitable for mothers

who prefer to know nothing about their labor. A majority of patients manifest a drop in blood pressure. There is danger of breakage of the needle in the caudal canal. Above all, the method presents a notable mortality for both the mother and the infant. Another real handicap of the continuous caudal analgesia is its restricted usefulness. In summary, caudal anesthesia is a method fraught with too many highly dangerous complications to be acceptable except in specially selected cases conducted by specially trained anesthetist-obstetricians.

EDWARD L. CORNELL, M.D.

Jarvis, S. M.: Paravertebral Sympathetic Nerve Block. A Method for the Safe and Painless Conduct of Labor. *Am. J. Obst.*, 1944, 47: 335.

Seventy cases of labor were carefully observed and followed, and the pains were relieved by single and multiple paravertebral sympathetic blocks and perineal pudendal blocks. The method is safe and simple and without sequelae, and can be done without elaborate equipment or extensive technical training. It definitely seems to speed the dilatation of the cervix without the many tiny lacerations so frequently seen postpartum. Spontaneous delivery is the rule. Contraindications to this procedure have been indicated. The first results from the management of labor by this method are gratifying, and further study is needed and is indicated. Pain stimuli from the uterus travel by way of the sympathetic system or the cord at the last of the thoracic rami communicantes. The pain of labor can be relieved by blocking the sympathetic chains in the lumbar area of the back. Thirty cubic centimeters of 1 per cent procaine in saline solution are injected on each side of the back between L 1 and L 2 just above the transverse processes. If blood is encountered, the injections are not made.

EDWARD L. CORNELL, M.D.

O'Neil, E. E.: The Use of Refrigeration in Amputations and Peripheral Vascular Disease. *N. England J. M.*, 1944, 230: 209.

Evidence was presented regarding the increased survival period of extremities with the reduction of temperature. Furthermore, the phenomena of shock, thrombosis, and injury to the blood vessels and nerves were markedly inhibited. An attempt was made at the Boston City Hospital to evaluate the role of reduced temperature in the treatment of various types of peripheral vascular disease. The method used was one of combined ligation by means of the tourniquet and refrigeration. In the case of a low thigh amputation, the entire leg and thigh up to the tourniquet site were surrounded by cracked ice, and the skin temperature was maintained at from 8 to 10° C. It took between two and two and one-half hours to produce sufficient anesthesia to allow painless amputation.

It has become apparent that reduced temperature has definitely promoted the comfort of the patient. The tourniquet is released just prior to the closure of the wound. No thrombosis in the blood vessels occurs and the blood is in its normal fluid state. Patients undergo refrigeration amputation without pain and without shock. Pulse and blood-pressure levels are not changed by the operative procedure. The usual postoperative discomforts such as nausea, vomiting, and pain are not experienced.

Postoperatively the temperature of the stump is allowed to return to normal by the gradual withdrawal of the ice bags placed around the stump. Healing is more slow because of the known tendency of cold to inhibit agglutination of wound surfaces. Sutures should not be removed for from fifteen to twenty days. Fifty-four patients from the Boston City Hospital were refrigerated. Of these, 50 came through amputation and 4 died before operation. There were 16 deaths and a salvage, in terms of the 1930-to-1939 figures, for unoperated cases, of 68 per cent. Of the 16 deaths, 14 were due to various manifestations of cerebrovascular accidents, sudden cardiac failure, or pulmonary embolism. A later series of 33 patients, both good and bad risks, showed a marked reduction in mortality after refrigeration amputation.

Further possibilities in the use of reduced temperatures in the treatment of peripheral vascular disease and of injuries, and in military surgery were discussed.

MARY KARP, M.D.

Kemp, W. N.: Convulsions during Anesthesia: Etiology and Treatment. *Brit. M. J.*, 1944, 1: 447.

Convulsions during general anesthesia are due to one primary factor—interference with respiration of the cerebral tissue-cells brought on by alkalemia, which is known to cause a form of occult anoxia from failure of the oxyhemoglobin of the blood to release its oxygen to the nerve tissues. The alkalemia is directly due to acapnia incurred by pulmonary overventilation, which in turn is fostered by fear, overatropinization, toxemia, and elevated metabolism, together with the use of ethyl ether administered by a semiopen technique. Four case reports are given in detail, all with uneventful recoveries.

The abnormal physiology of clinical cryptogenic conditions is reviewed with reasons for the administration of oxygen and carbon dioxide in the treatment of convulsions. Conditions which will give clinical alkalemia are mentioned with the conclusion that convulsions during ether anesthesia are a defense effort on the part of the body temporarily to stop pulmonary respiration and exhalation of carbon dioxide and to create carbon dioxide and lactic acid by muscular action in order to correct the alkalemia which causes failure of dissociation of oxyhemoglobin and the anoxia which in turn leads to inhibition of nerve-cell respiration.

The treatments of convulsions are enumerated. They include mainly the immediate inhalation of 5 per cent carbon dioxide and 95 per cent oxygen; the intravenous administration of pentothal sodium which should stop the convulsive movements; the intravenous infusion of 10 per cent glucose in normal

saline solution; the administration of carbon dioxide-oxygen mixtures for five minutes every half hour until the *p*H of the blood is below 7.5 or until an acid urine is being excreted; and the instillation into the stomach of from 2 to 3 dr. of ammonium chloride in six times that volume of water by means of a gastric tube. MARY KARP, M.D.

Waters, R. M., and Gillespie, N. A.: Deaths in the Operating Room. *Anesthesiology*, 1944, 5: 113.

The authors review the cases of 51 patients who died in the operating rooms at the Wisconsin General Hospital, Madison, during the ten-year period from 1933 to 1942, inclusive. The cases are arranged in 7 groups.

Group 1 includes 8 cases which were considered surgical deaths.

Group 2 includes those deaths which occurred as a result of the patient's condition; 2 cases came under this heading and were discussed in detail.

Group 3 incorporates those deaths due to the condition of the patient and the operation; 9 deaths during operation were due to these causes.

Group 4 comprises 12 cases in which anesthesia was considered the cause of death. Two deaths were caused by hypoxia during anesthesia with nitrous oxide; 2 were due to the injudicious exhibition of spinal analgesia; 1 death was the result of an accident in the course of endotracheal anesthesia with the use of an inflatable cuff; and 7 deaths occurred during anesthesia with cyclopropane (2 of these were probably due to faulty technique of administration, and 5 occurred in a manner suggestive of abrupt cardiac failure).

Group 5 includes the case of a patient whose death was due to the combined effects of the anesthesia and the operation.

Group 6 includes deaths due to the combined effects of the anesthesia and the condition of the patient; 10 cases are tabulated, with exploratory notes.

Group 7 includes 6 deaths due to the combined effects of anesthesia, operation, and the condition of the patient. The authors have tabulated the details of these 7 cases.

Four other deaths were not considered as part of the discussion in this article because the patients had not been under the care of the Department of Anesthesia at the time of their death, so that a total of 47 deaths are considered to have occurred during 44,894 administrations—a mean mortality of 0.104 per cent. The fact is stressed that the particular anesthetic used is of less importance than its judicious application. The incidence of death is higher with ether than with cyclopropane, and the incidence of death with pentothal is almost identical to that associated with ether. Tabulated figures show that the inhalation methods of administration are less conducive to fatal accidents than are other methods, for, with the exception of regional analgesia, the death rate is higher when intravenous and spinal methods are used.

The majority of the fatalities recorded in this article could have been avoided by the exercise of greater skill and judgment. It is believed that these attributes will become more readily available if the number of well trained and experienced anesthetists increases. MARY KARP, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Dannenberg, M.: Cholecystographic Studies with Priodax. *Am. J. Roentg.*, 1944, 51: 328.

The opaque media used for cholecystography up to now have all been basically the sodium salt of tetraiodophenolphthalein under various trade names. Because of convenience and the lesser reactions their oral administration is preferred to the intravenous method. The accuracy is approximately the same by the two methods.

Nevertheless, the toxic reactions with the oral sodium-tetraiodophenolphthalein still occur often enough to interfere with the efficacy of this drug: vomiting, diarrhea, and abdominal cramps are often noted and they may be attributed to the phenolphthalein part of the molecule.

For the past year the author used priodax as an opaque medium. This new preparation has no phenolphthalein radical and, thus, certain of the above reactions are eliminated. It is especially important that there is no laxative effect, a fact which, in addition to the removal of the inconvenience to the patient, precludes a decreased absorbability of the compound.

In a series of 143 cases there were only 5 per cent with vomiting and negligible intestinal symptoms. The absorption of the dye was satisfactory as proved by the great percentage of good fillings and homogeneous shadows. There were no contrast-filled gas shadows obscuring the fundus of the gall bladder, and no superimposed contrast-filled shadows of the intestine.

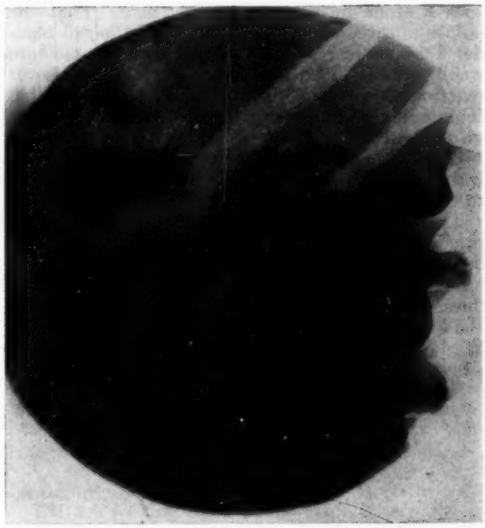


Fig. 1. Numerous sharply defined, vacuolated shadows within the fundus which are characteristic of cholelithiasis. Operative findings, September 16, 1942, confirm cholelithiasis.

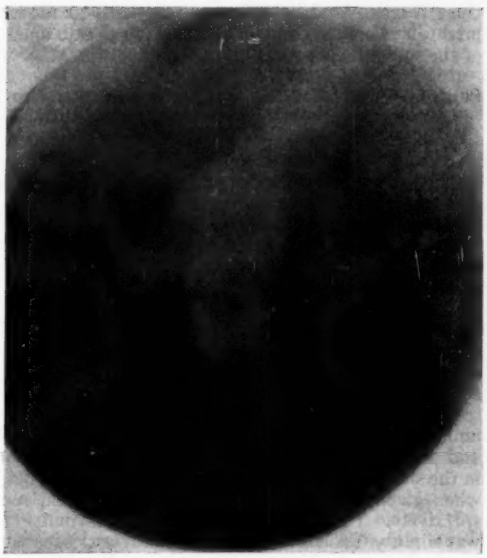


Fig. 2. Medium-sized gall bladder of good concentration. There are several vacuolated, ovoid areas filling the fundus. Gas in the colon is thrown away from the gallbladder shadows. Gas in the hepatic flexure is thrown away in this view which clears the fundus. Operative findings, November 27, 1942, confirm cholelithiasis.

The following is the technique employed by the author:

1. A control roentgenogram is taken prior to the ingestion of the contrast medium.
2. The patient is given a carbohydrate lunch.
3. Six tablets (0.5 gm. of priodax) are dissolved in one-fourth glass of water and one-fourth glass of fruit juice and then swallowed. The tablets may also be swallowed whole at ten-minute intervals.
4. No supper is taken.
5. No breakfast is taken.
6. The cholecystograms are taken fifteen hours after the oral ingestion and also after a fatty meal.
7. If there are any gas shadows, an oblique view is always taken to throw the colon away from the fundus.

In the entire series a good or fair concentration was obtained in 85 per cent. Optimal contrast density occurred in from thirteen to fifteen hours. Reliable differentiation between the visualized nor-

mal gall bladder and the nonvisualized pathological gall bladder could be secured easier than with the former methods. In cases with stones, the density of the priodax was light enough to permit good contrast (Figs. 1 and 2), whereas too dense shadows might have led to errors by the masking of gallstones of the millet-seed type. T. LEUCUTIA, M.D.

Paul, L. W., Pohle, E. A., and Benson, R. R.: Oral Cholecystography. A Comparative Study of the Single- and Divided-Dose Method. *Radiology*, 1944, 42: 226.

The introduction of priodax for cholecystography gave the authors the opportunity and the incentive to compare the drug with sodium iodophthalein for shadow-producing qualities; to determine the relative frequency of side effects, particularly on the gastrointestinal tract, and to review the procedure of cholecystography in general. Various technical details are discussed and the findings observed are tabulated and described. The results of these studies are embodied in the following summary and conclusions:

In a series of 46 patients, cholecystographic examination was done with both sodium iodophthalein and priodax. No significant differences were found in the shadow-producing qualities of these two drugs when given in single doses of 3.5 and 3.0 gm., respectively. The incidence of nausea and vomiting was slightly less with priodax, but diarrhea occurred nearly as frequently as with iodophthalein, although it tended to be less severe.

A total of 194 examinations in 148 individuals (including the afore-mentioned series of 46 patients) were studied. One hundred and fourteen of these received priodax and 80 received iodophthalein. In this larger series the results were not appreciably different. With the use of priodax, fewer cases showed faint shadows. The advantage of priodax is the ease with which it can be dispensed and administered.

The importance of the technical procedure in roentgenography is emphasized. The use of high milliamperages (200 ma.), a rotating anode tube, and short exposure times (from one- to two-tenths of a second) improved the diagnostic quality of the roentgenograms. Single doses of either drug were found to be satisfactory. If faint shadows result, the use of an intensified technique with repeated smaller doses will occasionally produce an intensification of the shadow, but, as a rule, this is not necessary. The authors have found that the procedure can be simplified if the technical features of the examination are given careful attention. The patient is instructed to take the drug after a fat-free supper, to avoid eating food of any kind afterward, and to report to the Department at eight o'clock the next morning. If gas obscures the gall bladder, pitressin is administered and the examination is concluded. If pitressin is contraindicated, a cleansing enema is given, though it is seldom as satisfactory as pitressin. A. HARTUNG, M.D.

Ochsner, H. C.: A New Cholecystographic Preparation. *Am. J. Roentg.*, 1944, 51: 326.

The author reports on the results of 300 consecutive cholecystographic studies made during a period of three months with priodax. This new contrast medium is a beta (4-hydroxy-3, 5 diiodophenyl) alpha phenyl propionic acid and is administered orally in the form of tablets.

In 56 per cent of the cases there was no reaction; in 14 per cent the reaction was mild, in 20 per cent it was moderate, and in only 4 per cent was it severe. Nausea occurred in 26 per cent of all cases and in one-tenth of these it was associated with vomiting. Slight or moderate diarrhea was noted in 15 per cent of the total group of cases. Other symptoms were: abdominal pain in 9 per cent, pain in the bladder area or pain on urination in 5 per cent, and in some cases there was an association of several of these symptoms.

The roentgen visualization was excellent, good, or fair in 67 per cent, with an incidence of stones in 9 per cent of this group, and it was poor in 31 per cent, with a stone incidence of 42 per cent. That the failure of satisfactory visualization of the gall bladder was not the result of intolerance to the medium would appear to be proved by the fact that fewer reactions occurred in the poorly functioning or nonfunctioning group than in the group in which good visualization was obtained.

Only 23 of the cases were operated upon. There was no error in diagnosis which could be attributed to the cholecystographic method.

The conclusion is reached that in cholecystography, priodax offers many advantages over previously used opaque media.

It is a preparation which is simple to take; it produces few reactions; and, since it is eliminated through the kidneys, it leaves little or no residual shadow in the bowel. On the other hand, it produces an ideal density for the visualization of stones.

T. LEUCUTIA, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Kenyon, A. T., Knowlton, K., and Sandiford, I.: The Anabolic Effects of Androgens and Somatic Growth in Man. *Ann. Int. M.*, 1944, 20: 632.

The extant data on precocious puberty in boys with interstitial cell tumors of the testis is reviewed and the association of somatic growth with the more familiar aspects of androgen action is described.

Testosterone propionate and chorionic gonadotropin are shown to induce retention of nitrogen, inorganic phosphorus, sulfate, and potassium in amounts so large as to necessitate the assumption of increase in the mass of nongenital tissue. Methyltestosterone has similar properties, at least in several respects. Sodium and chloride are also retained for a period with these agents. Calcium retention can be induced in certain subjects with testosterone propionate. Creatinuria may be reduced by testosterone propionate but increased by methyl testosterone. Basal heat production in the eunuchoid may be increased by testosterone propionate and methyl testosterone.

Growth in height and weight of the undergrown and underdeveloped boy may be produced by chorionic gonadotropin, testosterone propionate, or methyl testosterone. Maturation of bony structure occurs but closure of the epiphyses is not readily induced and requires prolonged heavy dosage.

The testis is accordingly conceived as exerting profound general anabolic effects and thus accelerating the somatic growth of the boy. It is possible that feminine androgens similarly influence the growth of the girl.

Certain nongenital sites of new tissue deposit in man under the influence of androgens seem strongly suggested. These are the skeleton and the skeletal musculature. The kidney and other organs may well be affected.

The anabolic effects of the testis do not appear to be exerted either through the anterior lobe of the pituitary body or through the adrenal cortex.

The mature normal testis is not exerting this anabolic or somatotropic influence to the fullest extent to which the organism can respond.

Since age does not seriously limit the metabolic response to the androgens, unknown opposing forces must operate to achieve the nitrogen equilibrium characteristic of maturity.

HOWARD A. MCKNIGHT, M.D.

Marangoni, B. A., and D'Agati, V.: Hepatorenal Failure in the Waterhouse-Friderichsen Syndrome. Two Cases with Prolonged Survival Periods. *Am. J. M. Sc.*, 1944, 207: 385.

The Waterhouse-Friderichsen syndrome is a distinct clinical entity characterized by an acute fulminating meningococcemia with adrenal hemorrhages and a rapidly fatal termination. A striking feature of this syndrome is the brevity of the clinical course, the majority of patients succumbing within twenty-four hours or less. This syndrome affects children primarily, 70 per cent of the reported cases occurring in patients under two years of age.

The paucity of clinical studies in this syndrome is due to the fulminating and fatal course so characteristic of these cases, which precludes any extended bedside observations. However, in the treatment of 134 cases of meningococcic infections by the authors at the Station Hospital, Fort McClellan, Alabama, 5 cases of the Waterhouse-Friderichsen syndrome were encountered, of which 2 were unique because of their prolonged clinical courses, namely, eighty and eighty-eight hours, respectively. This appears to be the first such report in the literature. These cases were unique in that they were characterized clinically by renal failure and pathologically by hepatic necrosis and glomerular and tubular changes in the kidney. These findings are similar to those found in the hepatorenal syndrome.

In the light of the authors' clinical observations, it is necessary to conclude that two stages exist in the Waterhouse-Friderichsen syndrome. The first stage is a fulminating one, usually resulting in death from shock and toxemia. Survival of this period ushers in the second or hepatorenal stage wherein death ensues from hepatorenal failure, which was first described by Heyd in 1923 to explain certain deaths following operative procedures on the external biliary system.

The fact that hepatorenal failure occurred only in the cases with the Waterhouse-Friderichsen syndrome and not in those of uncomplicated meningococcemia cannot be ignored. Infection alone fails to explain satisfactorily this puzzling fact because the hepatorenal syndrome does not occur in meningococcemia without adrenal involvement. It must be concluded that adrenal hemorrhage is a predisposing factor in the development of hepatorenal failure in the Waterhouse-Friderichsen syndrome.

JOSEPH K. NARAT, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Scott, R. B., Lyford, J., III, and Johnson, R. W., Jr.: Granuloma Inguinale as a Cause of Arthritis and Osteomyelitis. Report of a Case. *Bull. Johns Hopkins Hosp.*, 1944, 74: 213.

A twenty-year-old colored female showed signs of granuloma inguinale, which was confirmed by biopsy revealing Donovan bodies in large macrophages and masses of plasma cells in the tissues. Nine weeks after the appearance of a characteristic vulvar ulcer, the patient developed pain in both knees, elbows,

and the left third toe. Aspiration of the left knee produced sterile, straw-colored fluid. An ulcer developed on the left third toe. The toe was amputated and revealed osteomyelitis of the proximal phalanx. Donovan bodies and plasma cells were found in the bone and soft tissue. The swelling and tenderness in the joints gradually subsided and the condition assumed the appearance of rheumatoid arthritis. Exploration of the right elbow revealed the synovial membrane to be thickened like it is in any chronic nonspecific arthritis. The cartilage appeared smooth. Sections of the tissue showed Donovan bodies and masses of plasma cells. The patient was discharged as the condition appeared to be improved. Two months later the joint manifestations recurred and the patient was readmitted. The wrists, knees and ankles were swollen, hot, and tender. The interphalangeal joints of all the fingers showed fusiform tender swelling with draining granulating ulcers on several fingers. The genital lesions had recurred but the operative sites remained healed.

GEORGE I. REISS, M.D.

DUCTLESS GLANDS

Fotheringham, W. T., and Salié, C. M.: Hyperthyroidism; Plasma Proteins during Postoperative Thyroid Crises (Las proteínas del plasma durante las crisis tiroideas post-operatorias). *Rev. argent.-norteamer. cienc. med.*, 1943, 1: 212.

The specific gravities of whole blood and blood plasma were estimated by the method of Barbour and Hamilton and the values for plasma protein were then obtained from the latter with the formula of Weech, Reeves, and Goettsch. Attention was focused on the behavior of the plasma proteins in the postoperative picture of 11 patients with Basedow's syndrome, and the attempt was made to correlate previously reported thyreotoxic lowering of the plasma-protein values with the severity of any postoperative crises observed. This was done with the hope of arriving at therapeutic indications. Included in the study were also a patient with the Basedow syndrome who had undergone a two-stage operation, and, as controls, 2 patients with toxic adenoma and 1 with carcinoma of the thyroid gland, and, finally, 6 patients with simple goiter.

The normal value for the specific gravity of fasting whole blood was taken as approximately 1.053, that for fasting blood plasma as approximately 1.027, and that for the plasma protein in grams of total protein per 100 cc. of plasma as approximately 7.

In the 11 patients with Basedow's syndrome there was a considerable lowering of the values for the specific gravity of the blood plasma and the contained proteins during the first twenty-four to seventy-two hours following the subtotal thyroidectomy; this lowering maintained the closest relationship to the intensity of the postoperative crisis, but bore no relationship whatever to the preoperative clinical thyreotoxic picture. In 1 patient, indeed, in whom the authors had the good fortune to study a preoperative, or spontaneous, thyreotoxic crisis, the coincidental lowering of the plasma values corresponded closely to the severity of the preoperative manifestations, but exhibited no relationship to the values during the subsequent postoperative crisis. In 1 of the 11 cases of Basedow disease a two-stage operation was done, and the protein values following the first operation showed a considerable lack of coincidence with the proportionately severe crisis, while after the second operation there was only a minimal thyreotoxic crisis and a correspondingly insignificant lowering of the protein values. No evidence of crisis and no lowering of the plasma values were observed in any of the control patients.

From the results of this study, and from the observations at the autopsy of 1 patient, at which time edematous manifestations were found in important organs, especially the lung, liver, kidneys, suprarenal glands, and brain, by means of photomicrographs, the authors believe that the lowered proportions of plasma proteins in the blood, probably the result of a toxic poisoning, lead to increased permeability of the blood vessels with consequent edematous infiltration and destructive changes in the vital organs of the body. These considerations lead the writers to agree with Garlet that fluids should be administered during thyroid crises only sparingly (not more than 2,500 cc. every twenty-four hours), and that the protein content of the plasma should be raised by blood transfusions, or, better still, by means of normal or concentrated plasma.

The formula used by Weech, Reeves and Goettsch, as described by Moore and Van Slyke, is as follows:

Grams of total protein per 100 cc. of plasma = 343 (G − 1.007). (G is the specific gravity of the plasma.)

JOHN W. BRENNAN, M.D.

Sutton, P. W., and Gibbs, E. W.: Congenital Teratoma of the Thyroid. Case Report. *Am. J. Surg.*, 1944, 63: 405.

In 1935, Pusch and Nelson published a review of the literature and collected 43 cases of teratoma of the thyroid gland, of which they accepted 28 as being authentic. They added a case from their own experience, and, in 1938, Potter reported a similar case, thus bringing to 30, the total number of histologically proved cases in the literature. The following case is a typical example of a teratoma of the thyroid, and is of interest because the tumor was surgically removed from a living infant, and because it appeared clinically to be a midline tumor of the neck.

J. L. J., a three-months-old female negro infant, was admitted to the general surgical service of the Children's Hospital, Cincinnati, Ohio, on November 27, 1942. At birth the mother had noted a swelling in the neck which was about the size of a golf ball. Since then it had always been present but had varied in size occasionally, at times becoming larger and at other times smaller. There was no history of inflammation in the area. The mother had noted also that the baby breathed noisily at birth and had continued to do so, especially when lying down.

Physical examination was remarkable in that there was marked laryngeal stridor. In the neck was a smooth, firm, globular, nontender mass which appeared to be in the midline and extended from the level of the hyoid bone to the suprasternal notch. The mass measured 5 cm. in maximum diameter. In some areas it felt cystic and it seemed to become tense when the infant cried. The mass was fixed to the deeper structures of the neck, but the overlying skin was normal and nonadherent.

Stereoscopic x-ray examination of the soft tissues of the neck showed slight irregularity of the anterior tracheal wall due to pressure from an area of enlargement in the soft tissues.

The clinical diagnosis was tumor of the thyroid gland or cyst of the thyroglossal duct.

On December 3, 1942, the mass was removed through a transverse incision under endotracheal ether anesthesia. It was well encapsulated and was easily shelled out from its bed in the thyroid, and had no direct communication with any structure other than the thyroid, the remainder of which was normal. The wound healed per primam and the infant was discharged from the hospital as cured on December 16, 1942.

On gross pathological examination the tumor measured 3 by 4 by 5 cm. in size and was composed of a large thick-walled cyst surrounded by a fibrous capsule, from 2 to 10 mm. in thickness. There was within the cyst, and attached to it at several points, a large firm mass measuring 3 cm. in diameter, which was composed of a grayish-white tissue spotted with light tan streaks, tiny chalky white spots, and larger, irregular, well outlined, grayish-blue, translucent islands of cartilaginous tissue. In the center of the growth there was a space, 2 by 5 mm., which was filled with a clot of blood.

Microscopically, the tumor was composed of a conglomeration of tissue representing all three primitive germ layers, including cartilage, osteoid, and masses of nervous tissue consisting of glial cells and fibrils. In the centers of these masses were glandlike spaces, lined by tall columnar cells and resembling neuroepithelium. The cysts, noted on gross examination, were found to be lined by tall, columnar, glandular epithelial cells supported by connective tissue and surrounded by incomplete rings of smooth muscle. Some of the cysts were lined by stratified squamous epithelium which in some areas was markedly flattened. Islands of adipose tissue were also present, as were areas in which there was proliferation of the vascular endothelium with the formation of numerous capillaries. The remainder of the growth consisted of connective tissue which for the most part was of a highly cellular collagenous type but in some areas was of the myxomatous variety. A few thyroid acini filled with pale pink colloid were present in the fibrous capsule. The pathological diagnosis was teratoma of the thyroid gland.

This represents the thirty-first authentic report in the literature of a case of congenital teratoma of the thyroid. PAUL W. SCHAFER, M.D.

Clay, R. C., and Blackman S. S., Jr.: Lateral Aberrant Thyroid: Metastasis to the Lymph Nodes from Primary Carcinoma of the Thyroid Gland. *Arch. Surg.*, 1944, 48: 223.

The authors present 2 cases of lateral aberrant thyroid in confirmation of the theory of King and Pemberton that these growths are in reality metastases from a carcinoma of similar structure in the thyroid gland itself.

A twenty-one-year-old white male was found during a routine examination in 1941 to have a mass in the right supraclavicular region. This tumor mass was removed from beneath the sternocleidomastoid muscle and grossly diagnosed as lateral aberrant thyroid tissue. The microscopic diagnosis was "carcinoma invading the cervical lymph node and capsule of a papillary cystadenoma of an aberrant thyroid." In 1943 another mass was present in the same area. At operation two masses were removed, one from beneath the internal jugular vein and the other from the posterior mediastinum. At this time the thyroid gland was examined and two small nodules were found in the posterior part of the right lobe. This lobe was removed, and the nodules were proved by microscopic examination to be identical with the tumor removed in 1941, and the cervical nodes were metastatic thyroid tumors.

The second case recorded was that of a woman twenty-six years of age who in 1937 had so-called aberrant thyroid masses removed from the left side of the neck. These tumors had been present for four years. The microscopic diagnosis was "papillary cystadenoma of an aberrant thyroid." In 1943 the microscopic sections were restudied because of the renewed interest in this type of lesion and the diagnosis was changed to metastatic tumor from the thyroid gland. The patient was reexamined and a lump was found in the neck; this had been growing slowly for one year. At operation the nodule was found in the lower pole of the left lobe. A subtotal thyroidectomy was done and also a single encapsulated mass was removed at the level of the lower pole between the esophagus and the carotid sheath. Examination of the specimen grossly and microscopically revealed 2 additional intrathyroid masses in the right lobe. All 3 tumors in the thyroid gland were papillary cystadenocarcinomas and the extrathyroid mass was found to be a metastatic lesion from the thyroid.

Wohl in 1917 suggested that carcinoma in so-called lateral aberrant thyroids might represent metastases from primary tumor in the thyroid gland. Eberts in 1933 was even more specific and pointed out that the direction of lymph flow was away from the thyroid and toward the cervical lymph nodes. He also drew attention to the fact that metastatic lesions sometimes outgrew the primary lesion.

The microscopic appearance of these cystic papillary tumors is not a reliable index of their malignancy.

A growing metastases from a tumor destroys the node in which it lies. Random sections of such a

lateral cervical mass might well fail to show the architecture of the residual lymph node.

EARL O. LATIMER, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Rosenow, J. H., and McDonald, J. R.: The Histology and Histopathology of the Gastroenteric Stoma, with Especial Reference to Gastrojejunitis. *Gastroenterology*, 1944, 2: 161.

Tissues from 60 surgically removed nonulcerative gastroenteric stomata were studied histologically. No attempt was made to trace the progress of healing. The gastroenterostomies had been performed from fourteen days to twenty-seven years previously.

On the basis of previous studies, it must be assumed that certain changes seen in the slides were artefacts produced by the technique of gastric surgery in the presence of free hydrochloric acid. Among these changes were superficial erosions, intense congestion and hemorrhage, edema, and possibly certain mild cellular inflammatory changes.

The transition from the jejunal to the gastric side of the anastomosis, as evidenced by the surface epithelium and the glandular structures, was usually abrupt and clean-cut. The gastric mucosa usually was thicker than the jejunal mucosa and tended to tower over it. In most cases, the cellular characteristics of the gastric and jejunal glands were in no way abnormal. Cystic glandular structures occurred on both the gastric and jejunal sides of the line of union, usually at or near the line of junction. These arose either from Brunner's glands, which occur in the jejunum, or from the pyloric glands of the stomach.

There was the greatest variation possible in thickness, amount of scar tissue present, and disposition of the various bundles in the muscular coats. It was the rule to see great thickness with much scarring and bunching.

As a rule, the most acute reaction to the presence of suture material was to be seen in the earliest stomata, and there was a progressive increase of the chronic features of the inflammatory reaction with increasing age of the stoma. However, reaction to suture material in the human gastroenteric stoma may not die out or even become quiescent for many years.

Typical granulomatous fibrosing reactions to the presence of magnesium silicate (talc) were seen in 2 cases.

Gastrojejunitis was evidenced by the presence of lymphocytes, plasma cells, edema, fibrosis, and distortion of the orderly arrangement of gastric glands in varying degree. Not once were any great number of polymorphonuclear leucocytes (the harbingers of acute inflammation) seen in the mucosae of the stomata, no matter how recent or severe the clinical manifestations. The degree of inflammation in the most advanced instances of gastrojejunitis was usually most severe in the gastric mucosa. In the milder instances, there was no significant difference.

Extensive correlation of clinical and pathological features was not attempted. The clinical picture of an ulcerlike stoma is not a very trustworthy basis for the diagnosis of gastrojejunitis. Severe histological gastrojejunitis was not usually accompanied by the ulcerlike syndrome of the stoma. Conversely, this syndrome usually was not accompanied by a degree of anatomic gastrojejunitis severe enough to be of great significance. The severity of the symptoms is not an accurate gauge of the anatomic inflammatory disease in the stoma. SAMUEL KAHN, M.D.

EXPERIMENTAL SURGERY

Cannaday, J. E.: A Report on the Healing of Wounds as Influenced by the Use of the Sulfonamides and Cotton-Thread Sutures. *Ann. Surg.*, 1944, 119: 498.

A great deal of animal experimental work has been carried out with regard to the effects of the sulfonamides in wounds. Perhaps the most notable series has been conducted by Varco who performed 250 experimental stomach operations on dogs, covering a period of four years. These dogs were killed and the results noted from time to time. It was observed that when a suture line involving a hollow viscus had been dusted with sulfanilamide crystals union had been much more certain. He noted that when sulfonamide crystals had been dusted along the suture line, in every case there was found an unusually heavy deposit of fibrin which had firmly sealed the serosal surfaces at each suture line. Elsewhere the peritoneum was smooth and glistening.

Paracelsus said that in the final analysis it is the mustering defensive forces of the body which repel the invader and repair the damage. Since the sulfonamides are bacteriostatic and are thus able, for a while at least, to restrain toxic activity, it seems obvious that they should be used with the hope of lessening the incidence of wound infection.

The author's practice has been to use both sulfanilamide and sulfathiazole in all wounds whether contaminated or not. The amounts used usually have been small, from 1 to 3 gm. in the average abdominal incision. In practice it has been found that the crystalline forms of sulfanilamide and sulfathiazole are less likely to cake and are more soluble than either the powder or the granular form. It is believed that the crystalline forms, when used in serous cavities, as in the abdomen or chest, diffuse more readily and are less likely to promote the formation of adhesions than the powdered forms of these drugs. On the other hand, when the necessity to control oozing arises, as in bleeding from bone, powdered sulfathiazole firmly pressed against the oozing point, will usually stop the bleeding in a short time and may take the place of bone wax very well. Sulfanilamide is usually completely absorbed from a wound within forty-eight hours, whereas sulfathiazole, may persist for several days.

The editorial board of The American Academy of Orthopaedic Surgeons in a review of progress in

orthopedic surgery for 1942 mention the observations of Bick and Pheasant which are to the effect that as long as small amounts of sulfanilamide compounds were used and also as long as the drug was implanted deeply in the wound that neither delay in healing nor delay in recovery of function of the joint was noted; that small doses were adequate for the control of infection and did not cause reactions such as adhesions, fibrosis, or other joint alterations.

The author began using cotton-thread sutures soon after Alton Ochsner's first report, and has used them exclusively since that time. Meade and Ochsner showed that while unsterilized cotton has not quite the tensile strength of silk of equivalent size, sterilization of cotton by boiling produces an 11 per cent increase in its tensile strength, compared with only a 4 per cent increase in silk. In their experimental work on animals it was found that there were moderate inflammatory reactions in the cutaneous tissues around both plain and chromic catgut, those around the latter being somewhat more pronounced than those around the former. The edema was much greater than that surrounding either silk or cotton sutures.

Meade and Long hold to the technique laid down by Kocher, and later emphasized by Halsted, in regard to the use of suture material, such as the use of finer suture material and the obliteration of dead space; also, they believe that the combined use of absorbable and nonabsorbable material should be avoided. Apparently the compact structure of cotton prevents the ingrowth of tissue and lessens the incidence of suture sinuses which are rather common with the use of silk, particularly in superficial locations. It has long been known that the formation of sinuses incidental to the use of silk is much more frequent with continuous than with interrupted sutures, probably because infections are able to traverse the entire length of a wound along the tract formed by a continuous suture.

Silk is unquestionably an excellent suture material. However, it has come into disrepute with some surgeons because slowly healing sinuses occur if infection develops. They state that cotton permits less tissue ingrowth between its fibers, and, hence, is less likely to produce sinuses in the presence of infection. Cotton, therefore, partially obviates some of the more serious objections to nonabsorbable sutures.

In summary, as a result of extended clinical trial it is believed that wound healing is not interfered with by the conservative local use of the sulfonamides. In the author's opinion, the use of sulfonamides in wounds gives the surgeon an increased assurance of a lowered incidence of operative infection; it is believed that most of the infections occurring in contaminated cases will be less severe than might otherwise have been expected.

The technique and tabulation of results with regard to healing of wounds in which the sulfonamides and cotton-thread sutures have been used is given. It has been concluded that when cotton suture material has been used in accordance with an approved silk technique the results have been very satisfactory, also, that with the use of fine cotton sutures contaminated wounds usually heal without subsequent sinus formation. JOHN E. KIRKPATRICK, M.D.

Scott, C. C., Worth, H. M., and Robbins, E. B.: The Comparative Value of Some Blood Substitutes Used for Treatment of Experimental Shock. *Arch. Surg.*, 1944, 48: 315.

The comparative therapeutic values of a number of blood substitutes were studied in shock of dogs caused by means of venous tourniquets. The procedure was controllable, so that each animal was carried to a predetermined level of shock before therapy was instituted. One series of animals was studied in early shock, and a second series in shock of a more severe degree.

Untreated animals always died. The blood substitutes tested were citrated dog plasma, heparinized dog plasma, saline solutions of gelatin, pectin, and polyvinyl alcohol, and isotonic saline solution. All of these solutions were tested in early shock. In the more severe shock, citrated dog plasma and isotonic saline solutions alone were compared.

In both series, no difference in effectiveness could be demonstrated between any of these solutions. In this type of shock, water or sodium chloride, or a combination of the two was the effective therapeutic agent, while the colloidal substances did not add to or detract from the value of these blood substitutes.

Since this investigation was limited to shock resulting from venous tourniquets in dogs, it should not be concluded that saline solution would be as effective in treating other varieties of shock in animals or man. SAMUEL KAHN, M.D.

HOSPITALS; MEDICAL EDUCATION AND HISTORY

Levin, M. L.: Cancer Reporting in New York State. *N. York State J. M.*, 1944, 44: 880.

The author's experience with cancer reporting in New York State indicates that reporting is practicable in areas where the medical profession is informed about and sympathetic with the aims of reporting and the cancer program in general. The completeness of cancer reporting compares favorably with that of other reportable diseases. Cancer reporting has proved useful (1) in providing material for epidemiological investigation and for evaluation of progress in cancer control; (2) in public education; (3) in professional education; (4) in aiding the follow-up of cancer patients; and (5) in the administration of public health nursing service to cancer patients. J. M. MORA, M.D.

Bigg, E., Jennings, B. H., and Fried, S.: Inflammability Characteristics of Propylene Glycol and Triethylene Glycol in Liquid and Vapor Form. *Am. J. M. Sc.*, 1944, 207: 370.

The recent observations on the effectiveness of certain glycol vapors in bringing about striking air

sterilization suggest a most promising method for the control of airborne disease. It has been shown that the use of these substances, particularly propylene glycol and triethylene glycol, offers definite advantages over measures previously described. Bactericidal and virucidal concentrations of propylene or triethylene glycol vapor are odorless, nontoxic, effective in extreme dilutions, easy to distribute, and reasonable in cost.

In view of the possible widespread use of these materials as a means of prevention and control of airborne infection, the authors carried out a study to ascertain the fire hazard which might be created by their presence.

Since the concentration of propylene glycol and triethylene glycol vapor necessary for bactericidal action is 0.1 mgm. per liter and 0.005 mgm. per liter, respectively, it is obvious from the authors' observations that there is no hazard produced by the presence of this quantity of vapor in the air. Of propylene glycol, 855 times this amount is necessary to produce an explosive mixture, and of triethylene glycol, 26,000 times this quantity must be present. This explosive property, however, must be considered if an apparatus introducing superconcentrated gaseous mixtures is used, for at the point of exit of the gas such a concentration might be attained.

The possibility of danger arising from the condensation of glycol on cold surfaces in the treated space must be considered even though, as has been shown, very dilute aqueous solutions of glycol were obtained with the maximum glycol concentration plus a high humidity and the low temperature on the condensing surface.

It would appear that in view of the fact that relatively intense and prolonged application of heat is necessary to ignite solutions containing as little as 30 per cent of water, there is little chance for glycol condensates to burn in ordinary use. If, however, a fire should occur in such a treated space, due to other causes, the heat produced would probably bring about the loss of water from the condensate and thus the glycol might add to the general conflagration, just as the other objects or material present, such as woodwork and bedclothing.

Another source of danger would be at the area of storage of the glycol; here, too, if intense and prolonged heat were applied, fire might occur. However, it might be noted that this danger is no greater than that produced by the storage of other combustible materials, such as fuel oil. This hazard could be reduced by storing the glycol in aqueous solution containing as much as 20 per cent water.

JOSEPH K. NARAT, M.D.